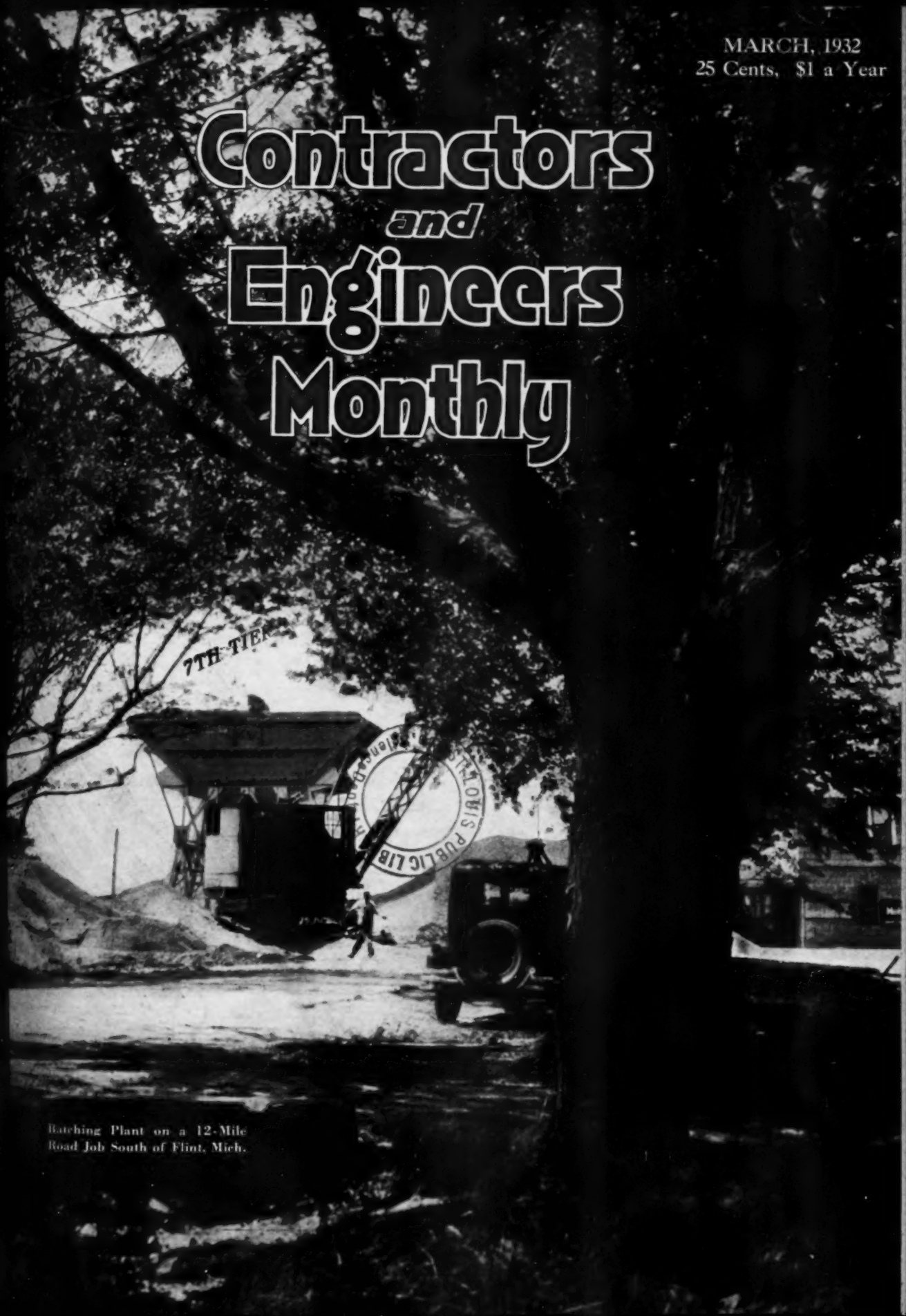
MARCH, 1932
25 Cents, $1 a Year

Contractors and Engineers Monthly



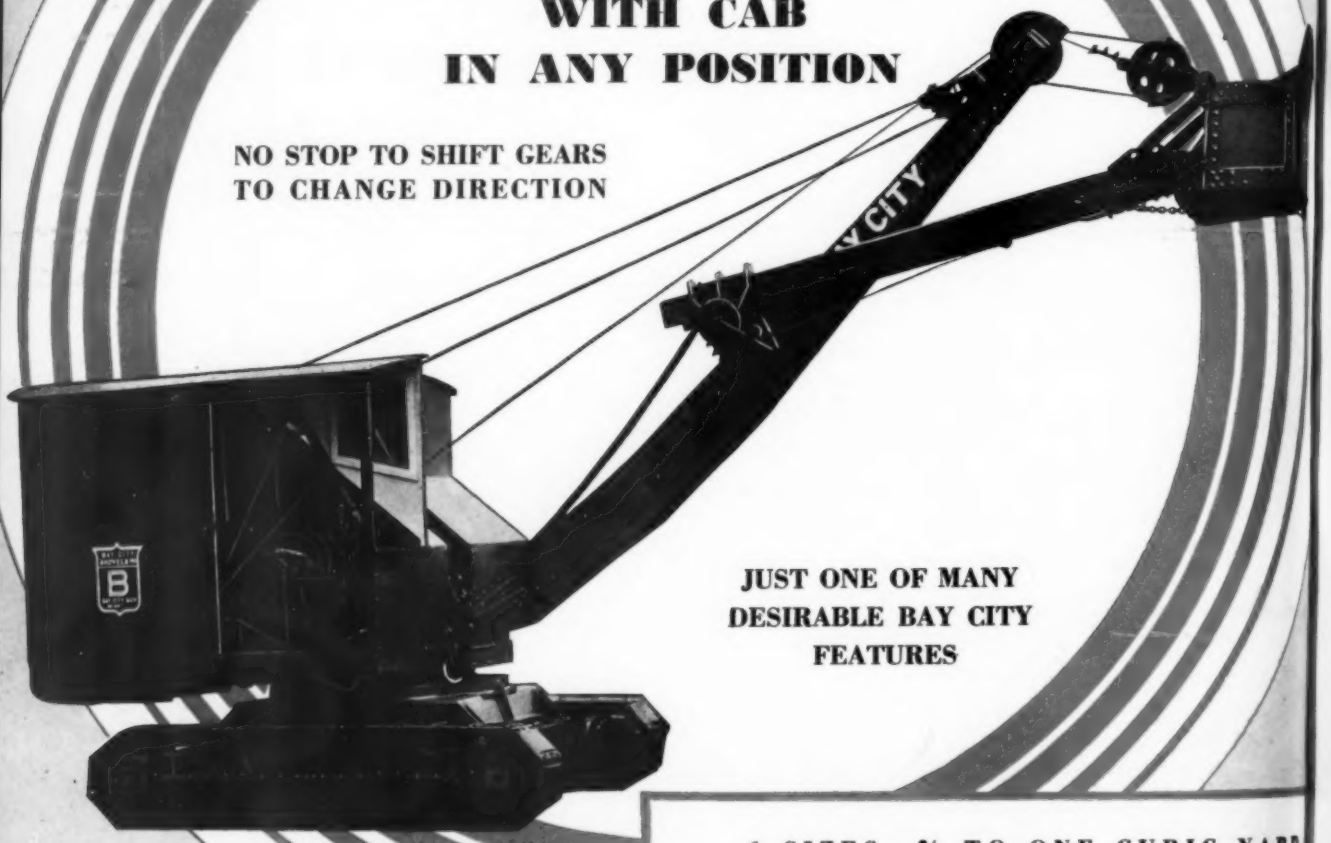
Batching Plant on a 12-Mile Road Job South of Flint, Mich.

INDEPENDENT STEERING AND PROPELLING

FROM OPERATOR'S NORMAL POSITION
WITHOUT STOPPING MOTION TO SHIFT GEARS

ALL REVOLVING BAY CITYS STEER OR PROPEL WITH CAB IN ANY POSITION

NO STOP TO SHIFT GEARS
TO CHANGE DIRECTION



JUST ONE OF MANY DESIRABLE BAY CITY FEATURES

6 SIZES—⅜ TO ONE CUBIC YARD

Unit Castings	Operate All Attachments
Chain Crowd	Shovel
E-Z Clutch Control	Crane
Frictionless Bearings	Hoe
Fast Speeds	Dragline
Large Center Post	Skimmer
Long Crawlers	Clamshell
Wide Swing Circle	Backfiller
Tandem Drums	

"Weight Where Weight Is Needed"

BAY-CITY SHOVELS

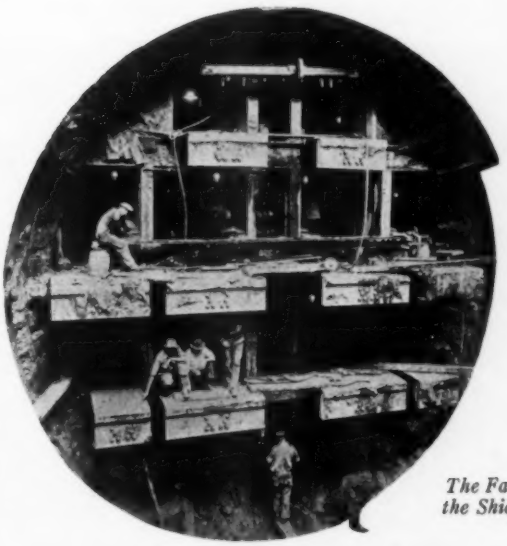
BAY CITY, MICH., U. S. A.
Representatives in Principal Cities

©

abs. ent

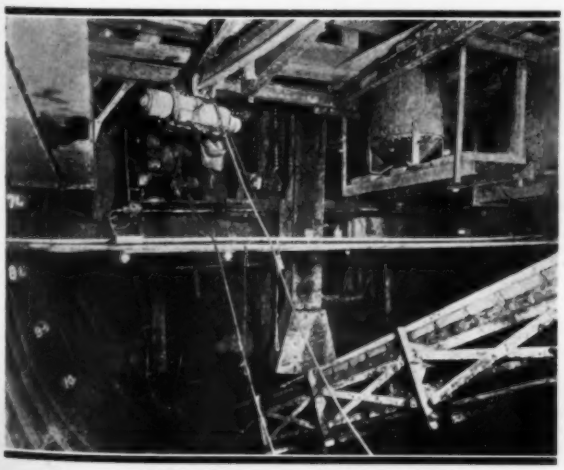
Belt Conveyors Handle Muck of Subaqueous Tunnel

Silas Mason Co., Inc. Is Using a Unique Material Handling Method in the East Boston Traffic Tunnel



The Face of the Shield

DISPOSAL of muck from the face of the shield has always been an important factor in subaqueous tunnel operations. In most cases the muck has been shoveled by hand from the various benches into narrow gage hand cars which, when loaded, were pushed by hand back to the material locks and then hauled to the shaft by some self-propelled locomotive. In the case of the Holland Tunnel in New York, the Hudson River silt was admitted through openings in the lower section of the shield. About 30 per cent of the displaced compressed silt was permitted to enter the tunnel on each shove. This was done for three reasons: first, to relieve the pressure on the face of the shield; second, to reduce the material handling costs; and third, to give greater weight to the tunnel to reduce its buoyancy. The material encountered in the East Boston Tunnel between Boston and East Boston under this section of the Harbor is a stiff blue clay underlain by a hard blue clay below which is sandy clay and small boulders. None of this material would flow which meant that every bit would necessarily have to be moved by hand unless some mechanical method was developed. The major portion of the material is cut from the open face of the shield by knives operated by two small pneumatic hoists. These knives are pressed against the face of the clay by hand. This produces slices of clay very similar in shape to those produced by the old time cheese-scoop and of a size readily handled by one man. The excavation at the shield amounts to approximately 30 cubic yards of material per foot of ring.



Close-up of the Shield Showing the Numbered Jacks at the Left, the Erector and the Apron Conveyor as Well as the Electric Monorail Hoist for Handling the Steel Segments from the Cars to the Erector.

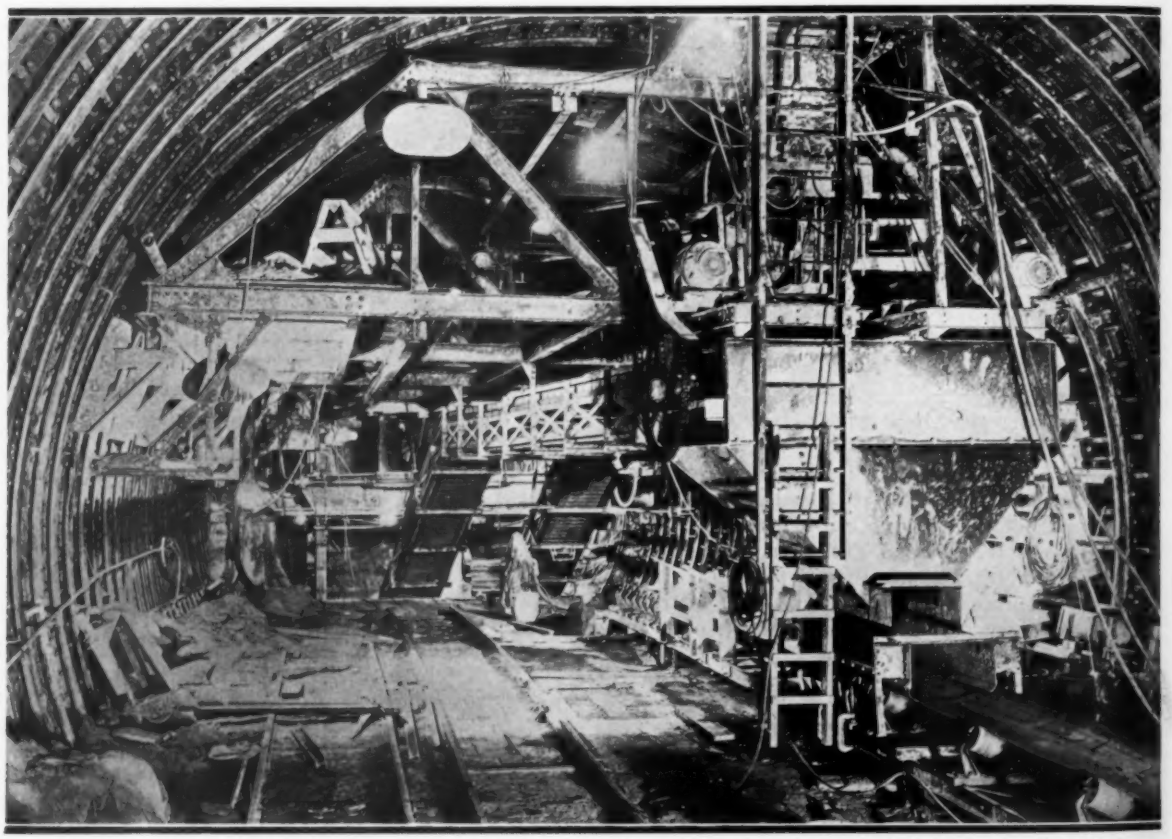
The East Boston Tunnel, which is 4,850 feet in length, is built with a fresh air duct 17 feet wide and 6 feet 3¼ inches high in segment form. The roadway clearance is 13 feet 6 inches and is 21 feet 6 inches wide. There is a 2-foot 3-inch walk on one side and a 6-inch cast iron water pipe and an 8-inch cast iron discharge line and duct beneath it.

REMARKABLE CONVEYOR SYSTEM

Instead of using the familiar industrial dump car, the muck is taken away from the shield by a pair of apron conveyors connected to the shield and moved forward with it. The lower horizontal 4-foot section of each conveyor receives the clay tossed down the chutes and carries it forward to the 36-foot section which rises at an angle of 25 degrees. The conveyors then extend 37 feet 7½ inches back horizontally, delivering to a movable hopper over a belt conveyor which carries the muck back to the locks. The Jeffrey apron conveyor which is 30 inches wide runs at a uniform speed of 25 feet per minute and is operated by a 7½-horsepower electric motor. The belt conveyor from the hopper to the lock is carried to a maximum length of 2,400 feet with a 20-horsepower electric motor for each 1,200 feet of belt.

Sundh Electric Co. control panels with an illuminated supervisory board designed and built especially for this application.

The operation of the two material locks starts at the flap valve which when thrown to one side loads the muck to No. 1 lock and when thrown to the opposite side loads to No. 2 lock. The cycle of operation of the locks, controlled completely by the special Sundh control, includes the loading period during which the lock is under air pressure and the loading gate is open. At this time the belt operates at a speed of 15 feet per minute. When the belt has traveled at this speed from one end of the lock to the other so that the belt is uniformly loaded with muck, the flap valve is thrown to load to the other lock, the loading gate is closed, the lock is decompressed through a 4-inch pipe equipped with a



A View of the Shield Showing the Sloping and Delivery Portions of the Apron Conveyors, the Hopper and a Short Section of the Belt Which Carried the Muck to the Material Locks

This conveyor has a Boston Woven Hose Co. belt 30 inches wide with Jeffrey idlers spaced 4 feet 6 inches center to center. The belt operates at a uniform speed of 150 feet per minute at the delivery end. Where the belt discharges into the receiving hopper at the material locks it rises at an angle of 15 degrees to the hopper.

OPERATION OF THE MATERIAL LOCKS

Two material locks, each 5 feet in diameter by 34 feet 6 inches long and containing a Boston Woven Hose Co. belt 36 inches wide and 28 feet long center to center of pulleys with Jeffrey idlers spaced 2 feet center to center, are operated and controlled electrically by

rapid opening release valve, the discharge gate is opened to free air and the belt speeded up to 22 feet 6 inches per minute, delivering the muck to the 1,040-foot belt which carries it to the boot of the Jeffrey scraper elevator.

As soon as the conveyor has made one round discharging the muck at the high speed, the Sundh control closes the discharge gate, opens the compression valve to bring the air pressure in the lock up to the pressure in the heading, slows down the belt to 15 feet per minute again and opens the loading gate just as the flap valve starts delivery to that lock again. The operations in the second lock are so synchronized with those of the

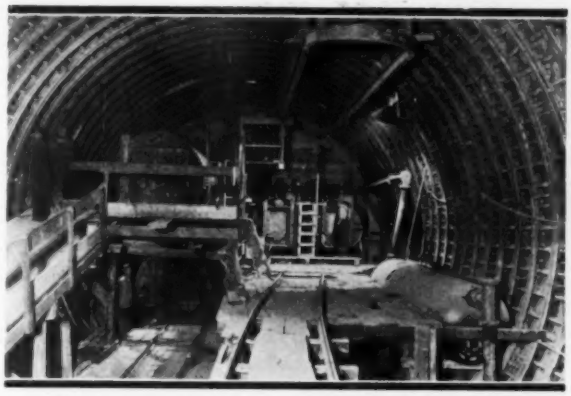
first that it is not necessary to stop the delivery belt operating between the apron conveyor and the receiving hopper of the material lock.

DELIVERY TO MUCK BIN

The 1,040-foot belt from the material locks to the elevator is 30 inches wide and operates at 150 feet per minute with the Jeffrey idlers placed 4 feet 6 inches center to center. This belt, driven by a 20-horsepower motor, rises at an angle of about 7 degrees as it approaches the boot of the Jeffrey bucket scraper elevator which carries the muck at a speed of 85 feet per minute and an angle of 60 degrees with the horizontal up to the three 20-ton muck storage bins above street level. The scraper elevator is operated by a 50-horsepower motor. Although storage for 60 tons of muck is available it is found advisable to keep a sufficiently large fleet of trucks in operation to load almost directly from the scraper elevator through the bins to the trucks as the stiff mucks tends to pile up in the bin and "set" if it remains there any length of time.

Thus, from the time the muck is tossed down the chute at the shield until it reaches the body of the trucks, it is handled by this remarkable conveyor system entirely automatically and with the minimum of supervision. One man tends the pair of apron conveyors, another watches the receiving hopper between the apron conveyors and the belt conveyor delivering to the hopper at the material lock, another remains at the flap valve, an electrician is on duty at the Sundh timer and one or two other men between the locks and the bins. The belt conveyors are located at the right side of the deck facing toward the shield, leaving the remaining portion of the deck unencumbered except for a single-track industrial railway over which the segments and other materials are hauled forward as required, using the 5-foot diameter by 28-foot long emergency lock at grade for delivery to the section under air. The job is remarkably free of moving trains and is unusually clean, due to handling the muck by conveyors.

The Shaft Showing the Bucket Scraper Elevator Carrying Muck Up to the Bins



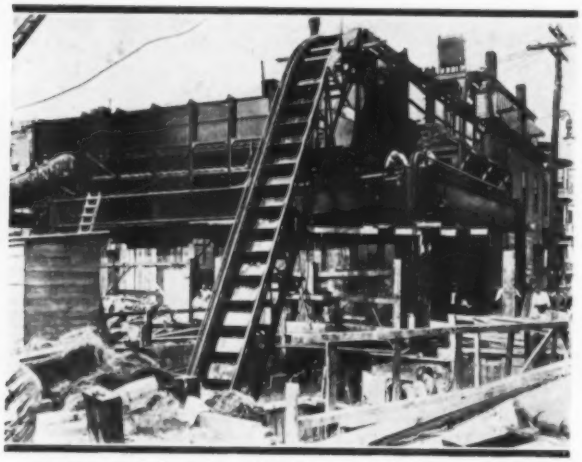
The Locks—Upper Left, the Man Lock; Lower Left, the Material Lock; Top Center, the Emergency Lock; and at the Right, the Pair of Automatically Operated Muck Locks

TRANSFORMER STATION AND COMPRESSOR PLANT

Power for the operation of a project involving compressed air is most important. Protection against failure of power on the Silas Mason job is secured by using two feeders, one from the East Boston plant of the Commonwealth Gas & Electric Co. and one from the South Boston plant of the Edison Electric Illuminating Co. of Boston. Two banks of feeder lines are arranged in the substation through elaborate switchboards. The line voltage is 13,800 stepped down to 2,300 for the compressors and to 220 for the tunnel services.

The compressor equipment consists of three I-R low pressure units 25 x 18 inches, operating at 200 rpm. There are two high compression units with cylinders 12½ x 14 and 20 x 14 operating at 257 rpm. The high pressure units work at 90 to 105 pounds and the low pressure units, 25 to 30 pounds. All compressors are motor driven from a 2,300-volt line. The control voltage on the motors is 220 volts. Replacing the earlier type of accumulator in which hydraulic pressure is built up for driving the shield, beneath a weighted piston, a much less cumbersome and more readily controlled hydro-pneumatic Watson-Stillman accumulator was installed. Because the space available in the East Boston station is limited and the foundation conditions unsatisfactory for heavy loads, this type of accumulator is particularly adaptable. The hydraulic power plant consists of two motor-driven hydraulic pumps, one hydro-pneumatic accumulator, complete with a reservoir and air compressor, and suitable control apparatus, pipe manifolds, valves and fittings. The pumps are Watson-Stillman horizontal four-plunger heavy-duty hydraulic pumps, having plungers 1¾ inches in diameter and a 12-inch stroke. The capacity of each pump is 5,750 cubic inches per minute, against hydraulic pressure of 5,850 pounds per square inch. Each pump is a motor-driven unit, having a 100-horsepower motor, geared to the crankshaft through two trains of gears. Each pump is mounted on a sub-base on which is also mounted the motor, making each pump an entirely self-contained unit.

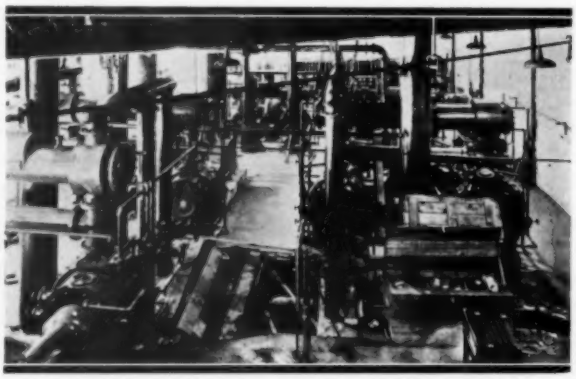
The accumulator is a Watson-Stillman hydro-pneumatic machine, which comprises an accumulator unit, an



The Top of the Bucket Scraper Elevator and the Muck Bins

air reservoir, a small air compressor and suitable piping. The accumulator unit has an air cylinder 42 inches in diameter, an hydraulic ram 8 inches in diameter with a stroke of 48 inches. The air reservoir is 5 feet in diameter by 14 feet high. The compressor is a small locomotive-type straight-line two-stage compressor, suitable for driving by steam or by compressed air of approximately 90 pounds per square inch. In this installation the compressor is operated from the high pressure air service line. The hydro-pneumatic type accumulator differs from the old style weighted accumulator in having a large air cylinder and piston under constant air pressure to develop the downward thrust on the hydraulic ram, which was originally accomplished by a large tank, or platform, loaded with pig iron, boiler punchings or other heavy ballast weight. The air piston is 42 inches in diameter, having an area of 1,385 square inches, and is under constant air pressure of 200 pounds per square inch. This produces a downward pressure on the hydraulic ram of 277,000 pounds and is equivalent to a dead weight of 138½ tons. The hydraulic ram of the accumulator is 8 inches in diameter, having a 50-square inch area. The hydraulic pressure is, therefore, 277,000 pounds divided by 50 or 5,540 pounds per square inch. This is the hydraulic pressure under 200 pounds per square inch air pressure. The hydraulic pressure can be varied by changing the air pressure. The air is bottled up in the reservoir and in the air cylinder of the accumulator and is not discharged. Therefore, it is only necessary to have a small compressor which is used for initially charging the system with compressed air and for compensating for such slight leakage as may occur.

The accumulator is used as a reservoir for water under pressure; it receives the constant delivery from the pumps and delivers intermittently to the shield line, according to the demands for pressure water. The accumulator moving parts actuate two trip mechanisms, each of which controls the operation of the suction valves on one of the pumps. Thus the pumps, while running continuously, deliver water to the accumulator only when needed to maintain a sufficient capacity in reserve.

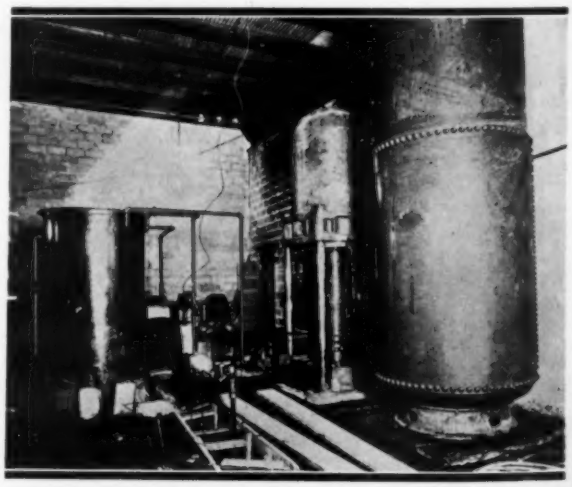


The High and Low Pressure Air Compressors With the Electric Control Panels in the Background

OPERATIONS AT THE SHIELD

The shield for this job measures 31 feet 7 inches overall and is pushed forward by thirty 10-inch Watson-Stillman hydraulic jacks operating at 4,500 pounds per square inch pressure. As mentioned earlier in the article a pair of air motors mounted on the face of the shield are used to operate knives or slicers to cut the stiff clay ahead of the shield. Pneumatic clay spaders are also used. To remove the water released by the hydraulic jacks in operating them and the small amount of leakage from the surrounding ground no pump is required as a 4-inch pipe is embedded in the concrete, forming the bulkhead for the air lock and being carried forward to the area immediately behind the shield, terminating in a valve to which a flexible rubber hose of the suction type is attached and carried to the water. By merely opening the valve the pressure of the air at the heading forces the water out through the hose to atmospheric pressure and into a sump from which it is pumped to the surface.

The steel segments for the tunnel lining are 30 inches wide and 8 inches thick at the ends by 8 feet 10 13/16 inches long requiring 11 segments for the 31-foot diameter circle. These are brought up to the shield on the industrial track, using flat cars hauled by Mancha electric mules. A monorail electric trolley suspended from the shield jumbo handles the segments



The Hydro-Pneumatic Accumulator in the Power House

from the flat cars to the erector arm.

Working three 8-hour shifts a day, the crews have erected as many as 9 complete rings in 24 hours. Since the shield was started under the river, the pressure has been carried at 20 to 22 pounds and four 6-hour shifts are working. Under these conditions, the crews have erected as many as 12 complete rings in one day and have carried the excavation in 13 shoves, or a distance of 32½ feet. The record progress to date is 155 feet and the average of the whole job about 76 feet per 6-day week. The segments have eight ASCE 45-pound rails as stiffeners and are built up of channel and angle sections and plates with ⅞-inch holes for ¾-inch bolts. Working six days a week at the shield between August 1 and December 12, the three crews drove the shield a distance of 1,360 feet or 1,390 feet including the shaft. The seventh day is devoted to clean-up work and overhauling equipment. During most of the work 16 pounds of air is carried at the face with reduction to 10 pounds whenever the work is in particularly stiff clay devoid of moisture.

Double Track and Muck Conveyor Showing the Clear Space in the Tunnel and the Absence of Accumulations of Muck Common Where It Is Moved Out By Rail

GROUTING THE TUNNEL

Soon after the placing of a ring, an annular ring of grouting about 3 inches thick is placed around the tunnel through grout holes previously drilled in the segments and plugged. Using the O'Rourke method, a mixture of one bag of sand to six bags of pea gravel is forced through the grout holes and later cement and water are forced through with a Union Iron Works machine to complete the grouting.

Once a week the base line for the tunnel is brought in from the outside and carried forward to the shield absolutely independently of previous work. Platforms for the instrument men are suspended from the ceiling of the tunnel and independent platforms for the instruments also suspended from the top of the tunnel. Sights for line were permanently set up along the roof of the tunnel with a horizontal brass bar and vernier. Remarkable accuracy of line has been maintained throughout the work at the shield.

To permit pouring the concrete invert of the tunnel while material is transported over the decking, the floor system at the approximate elevation of the roadway is hung from the ceiling of the tunnel by cables for distances of 50 feet so that a section of that length can be poured at one time. The hangers are spaced in two lines at about the one-third points of the roadway and spaced 5 feet on centers longitudinally. Timbers, mostly 6 x 12's, are used to span the roadway and support it. The 6 x 6 posts which are used to support the flooring are removed during the pouring of the invert which is 18 inches thick.

A mono-rail system was installed at the entrance of the tunnel over a timber platform and then run out over the industrial track. It is equipped with an electric lift and is used for handling the batteries of the locomotives. Electrical connections from the platform to the main power house permit charging three complete sets of batteries at one time within the tunnel on this platform.

OPERATIONS OF AIR LOCK AND PRECAUTIONS

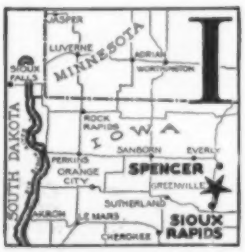
About 320 men are working daily under compressed air in the tunnel, the pressure varying from 20 to 22 pounds above normal atmospheric pressure. The contractor maintains a complete hospital for treating cases of the "bends." The hospital lock is not much larger than a good sized bathroom but it can accommodate a score of men if it were necessary to treat that number at one time. It is built in two connecting locks so that different degrees of pressure can be applied to the two chambers and while cases are being treated in the inner chamber, new cases can be introduced in the outer chamber and the pressure in that section can be stepped

(*Continued on page 31*)

Industrial Railway

on Long Iowa Paving Project

Henkel Construction Company of Mason City, Iowa, Ran the Only Industrial Outfit in State in 1931



IT is rather interesting that during the 1931 construction season there was only one industrial railway hauling highway-job in each of two of the major middle western states, Wisconsin and Iowa, the Universal Engineering Co. working at Tomahawk, Wis., and the Henkel Construction Co., working at Greenville, Iowa. The Henkel job was 14.49 miles in length and ran from Spencer on the north, through Greenville to Sioux Rapids on the south. The job was handled with three batching plant set-ups located at Cornell, Greenville and a spur and the paving started at the south end and paved right through to Spencer.

The sand and gravel were supplied by the State of Iowa from the Wallingford, Iowa, pit of the Concrete Materials Corp. of Waterloo, Iowa. Penn-Dixie bulk cement was supplied by the contractor. The aggregates were unloaded at Cornell, Greenville and the spur to the large stockpiles or direct to the Blaw-Knox two-compartment bins and weighing batchers by a Koehring crane with a 40-foot boom and a 1¼-yard Blaw-Knox bucket. An average of sixteen cars of aggregate were unloaded each day. The batches as made up for hauling to the paver in the individual batch boxes consisted of approximately 1,700 pounds of gravel, 1,430 pounds of sand and 669 pounds of cement.

Operation of the Industrial Railway

The labor organization at the unloading and batching plant comprised one man in the aggregate cars, the crane man, and one spotter for the cars at the batcher who also handled the switches around the yard. Ten-car trains were run throughout the job as there were no heavy grades and therefore no need of a booster on the grade. One 7-ton Plymouth gasoline locomotive worked in the yard, exclusively handling the empties and shifting them through the loading. In addition there were four other 7-ton Whitcombs for hauling, one Plymouth 7-ton and a Whitcomb 6-ton locomotive for shifting the aggregate cars.

The Formgrader with its Bronze Operator

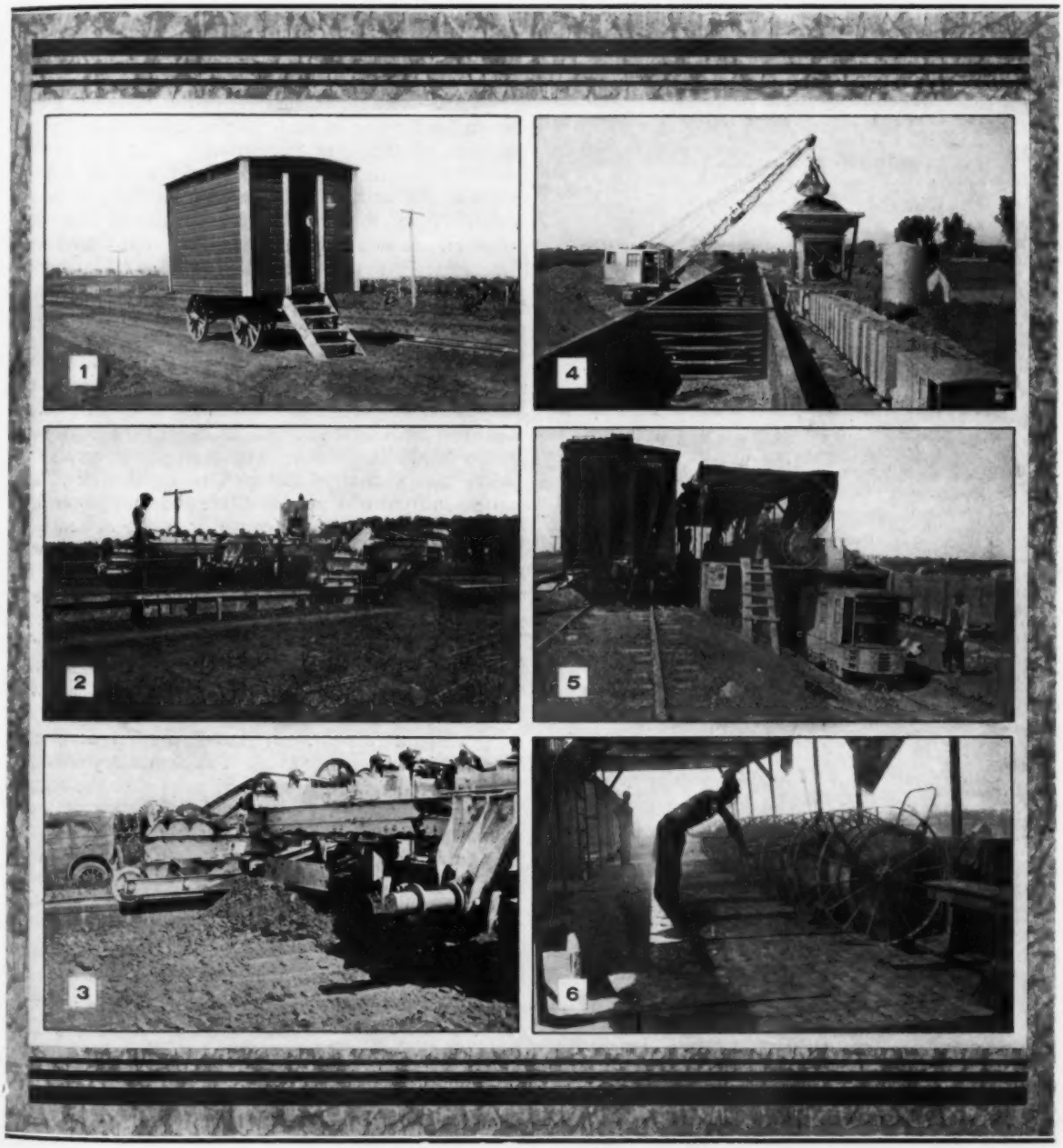
The method of operation in the yard was to bring in a train of empties and run them into a siding on the far side of the batcher from the aggregate cars. The hauling locomotive then picked up the loaded train on the main track, ran through the batching plant and departed for the grade. The yard engine then ran out and picked up the empties and proceeding so that it pushed them, ran the train through the batchers until each of the twenty Western bottom-dump batch boxes had received its proper weight of stone. Then the locomotive ran the train through the batcher to the cement dock about 300 feet distant and there in two spottings, to be described in detail later, the train was loaded with cement. It then pulled back under the batcher and received the sand. Then the yard locomotive cleared and left the full train ready for the next hauling locomotive which was bringing in an empty train.

The seven miles of track that were laid first to the south of Cornell, Greenville and the spur and then to the north were laid with a switch and siding every 700 feet. Thus in any one day the trains at the paver used two sidings. Koppel track and Western cars and batch boxes were used. Two men with proper tools and a hand car maintained the entire length of industrial railway track on the job. It was a strange sight to see the two men come pumping down the shoulder with the high hand car with such a narrow base.

Two Sets of Ten Traps at the Cement Dock

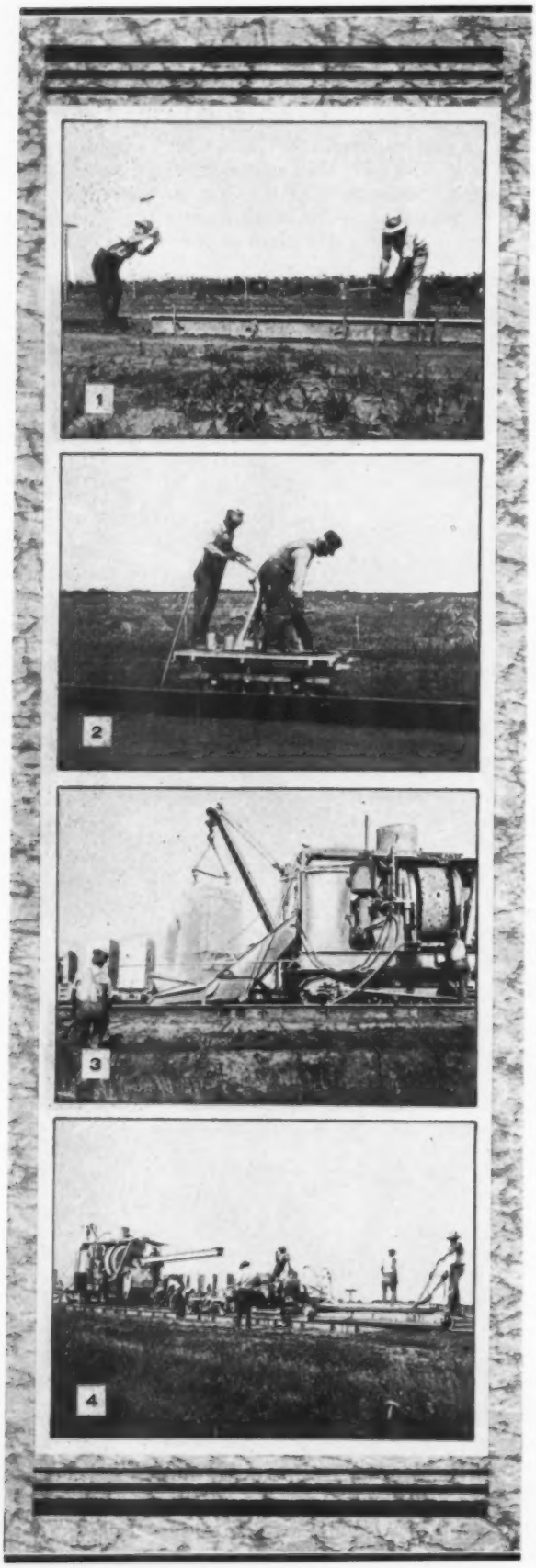
Because of the slack in the couplings of an industrial train it was impossible for the cement dock to be built

so that the entire train of ten cars or twenty batch boxes could be loaded with one spotting of the train. The cement dock was 84 feet long and 12 feet wide for the platform for wheeling and with a 2-foot extension for the dumping traps and 4 feet beyond that. This was roofed over to form the tunnel for the train and had burlap hanging at the side to cut off the wind. The entire dock was also covered with a canopy of burlap to protect the men from the sun. There were six men working on the dock, three men for each car. Each man loaded and weighed his own Sterling concrete cart and wheeled it to one of the empty traps where the twenty carts were spotted awaiting the arrival of a train. The dumping traps were of sheet iron with the sides curved to admit the body of the carts. The Fairbanks scales, well protected from wind and cement by boxing all but the beams, were located in the center of the dock so that the men never had to cross each other's path in coming from the car, weighing and wheeling to the traps. The men from the first car wheeled to the ten traps at their end and the men in the second car similarly wheeled to the traps at the other end of the



GRADING AND BATCHING DETAILS

1. The portable tool house for the grading crew. 2. The Nu-Method subgrader delivering excess earth from the grade to the shoulder. 3. A close-up of the subgrader showing some of the dirt picked up by the cutters and about to be pulled back onto the conveyor by the mechanical hoes. 4. The long boom of the Koehring crane permitted the batchers to be set up on the opposite side of the aggregate delivery track. 5. The bulk cement loading tunnel. 6. The cement dock with twenty cement buggies ready to be dumped.



dock. The train was spotted twice to load all the batch boxes. Thus the large amount of slack in the couplings of the cars was taken care of and the cement dumped without spilling over the sides of the boxes.

GRADE PREPARED FAR AHEAD OF THE PAVER

The forms for the slab were set fully 2,000 feet ahead of the paver so that there was never any chance of the paver catching up with the graders and the forms setters even if there was a section that was difficult to prepare. The finished grade was as smooth as the concrete pavement itself because there was no cutting by trucks after the final rolling. Stakes for grade and line were set by the engineers every 25 feet on vertical and horizontal curves and every 50 feet on straight grade. The stakes were set at the right of the grade and a nail driven for the line so that the pins could be set by the operator of the Carr Formgrader. The forms were leveled with a carpenter's level from the stakes and the width of the pavement measured from the nail in the stake. Three men set the Blaw-Knox 10-inch steel forms on one side and then the other. The Carr Formgrader used bears serial number 2 and is still doing its work with the accuracy of its first job. The forms were moved up at night on flat cars pulled by the 6-ton industrial locomotive. By moving at night there was no need of cluttering the shoulder with teams and wagons during the day and the railway was not used for other purposes during the night. Two men tamped the forms and oiled them with a brush. As soon as the forms were firm a Nu-Method power subgrader cut the grade true to line and discharged the spoil to the shoulder. The cutters in front trimmed the grade and then power hoes pulled the earth into the conveyor which moved it to the side. The subgrader was pulled by its own power, using stakes set ahead of the machine with cables attached to the stakes and to the drums on either side of the machine.

In front of the subgrader a Caterpillar Twenty with a Euclid 5-foot rotary scraper cut high spots and carried the earth to low spots. A Carr 7-tooth rooter was also used where the earth needed loosening. Behind the subgrader an Austin 5-ton Bull Pup roller compacted the grade where there was fill. Supplementary rails that fitted over the forms were used to protect the regular 10-foot forms when the subgrader passed over them. These were placed immediately ahead of the machine and carried ahead as soon as the machine had run over them.

On the fine grade ahead of the subgrader was a tool house built on a wagon which was used to carry all the fine grade tools such as shovels, stakes for the forms, carpenter's levels and other small tools. It was the repository for all tools at night and was locked against petty thievery.

FORM SETTING AND CONCRETING

1. Form setters driving the stakes on a rail, almost 2,000 feet ahead of the paver. 2. A novelty on a road job—an industrial railway hand car used by the track maintenance crew. 3. Dumping a batch box into the paver skip. 4. A panorama showing operations from the paver to the bull float.

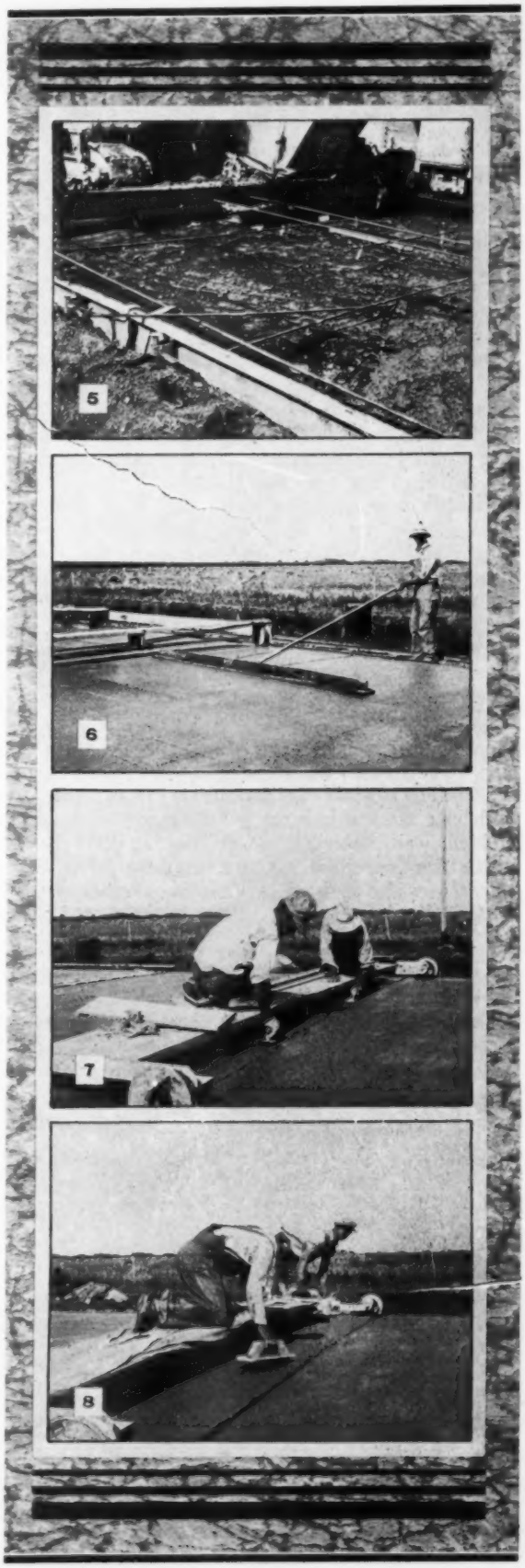
HANDLING THE BATCHES AT THE PAVER

When the 10-car trains approached the paver they had to wait until the previous train was emptied and had run ahead to the next switch or siding. Then the full train went forward to the paver, dropped two full cars at the paver and went forward past the switch where the empty was standing, and waited for the empty to pull out and pick up the two cars which the full train had dropped. Then the full train took its stand at the paver. One man on the outside hooked the boxes on that side and another on the inside attached the other hook and tripped the latch on the bottom-dump doors. One man on the paver operated the hoist to raise and swing the boxes from the cars to the skip of the Koehring paver.

HANDLING THE REINFORCING AND EXPANSION JOINTS

A Koehring subgrade planer cut the excellent grade, already prepared by the power machine, to the final cross-section and two men shoveled the excess out to the shoulders. To insure positive action by the subgrade planer pulled by the paver it was weighted at each side by a small drum of concrete and a beam of concrete giving a total weight of 800 pounds. This made it unnecessary to have men stand on the planer to insure cutting when it moved ahead on hard ground. The subgrade planer carried a steel shipping drum of the steel chairs used for setting the transverse bars. All the pressed steel was placed by two men. There were ⅝-inch round center bars 30 feet 10 inches long, one on either side of the center line of the pavement and spaced 9 inches from the center. These were crossed with 11-foot bars, also ⅝-inch in diameter, at intervals of 3 feet, the transverse bars being placed alternately 6 inches from one side and then from the other. At the sides, and spaced 9 inches from the forms by special spacing bars, were ⅝-inch bars 30 feet 10 inches long. The center and the side bars did not run through the expansion joints which were spaced 60 feet apart on this job. This was the only project in the state in 1931 which was using poured joints. One man prepared the expansion joint bulkhead on the shoulder and put in the dowels spaced 2 feet apart across the joint and with steel sleeves on the side away from the paver. The expansion joint bulkhead had a metal top and sides with slots for the insertion of the dowels. The sides of the slots were made of soft rubber so that the dowels were cleared as the bulkhead was withdrawn.

In the spacing of the transverse bars a wood bar notched at the ends to give the correct spacing was used. It required but an instant for the man to place the bar on the last rod set and get the correct spacing for the next. The bars were supported at the end close to the



REINFORCING AND FINISHING

5. The long-handled supports or chairs for the cross bars. 6. The 10-foot long-handled float which was followed by the checking straight-edge and then the 10-inch belt. 7. The preliminary finish or cutting along the sides of an expansion joint cap. 8. Pulling the cap and finishing the expansion joint.

form by tying to the longitudinal bar, and at the center by wiring to the center longitudinal bars. At the middle of the transverse bar a removable support with a handle was used. As soon as the concrete was poured and could support the bar the support was withdrawn.

SPREADING AND FINISHING THE CONCRETE

The subgrade of the road was covered with six rolls of tar paper spread immediately ahead of the pouring of the concrete each time the paver moved ahead. The six 38-inch rolls covered the entire grade and were spread before the steel was placed. As soon the paper was rolled ahead the puddlers cast several shovelfuls of concrete over them to prevent blowing out of place.

Due to the careful spreading and spotting of the concrete bucket only two puddlers were necessary. Two men took care of the spading along the forms so there would be no honeycomb at the edges of the pavement. The expansion joint bulkheads were prepared at the side by one man who was assisted by the two steel men when it was time to set the joints. A steel right triangle made up of angle irons was used to set the expansion joint bulkhead correctly across the road. A Lakewood double-screed finishing machine followed up the puddlers and towed a Heltzel Flex-Plane machine on the second pass over the slab. The ribbon of joint material which was carried on rolls on the machine was set and floated by the two longitudinal float men. These same men used the 12-foot longitudinal float from a double rolling bridge.

Two finishers handled the final preparation of the slab. They used 10-foot floats with long handles, then the checking straight-edge and then the two 12-inch belts. Following this the edger pulled the expansion joint cap and bulkhead. The edger, in addition to pulling the caps of the expansion joint, cut and edged the joints with a helper who also assisted in spreading the burlap. The burlap was carried on a bridge in strips 10 feet in width.

POURING EXPANSION JOINTS

1. The tar paper and earth dam near the edge of the slab to prevent the molten tar from flowing out of the joint. 2. A steady hand prevented wasting tar when pouring the joints.

POURING THE EXPANSION JOINTS

Because of the 2-inch crown of the 18-foot road the pouring of the expansion joints was a real art. It was a question of the rate of cooling as the material poured in the center flowed to the sides. Special dams were placed at the side of each joint by the men who assisted in temporarily uncovering the pavement the following morning for the inspector to check with the rolling device which scratched wherever the pavement was ⅛-inch high. The dams were composed of a small piece of tar paper placed over the side and about 18 inches over the end of the open joint and covered with earth. The tar was melted in a small kettle heated by wood and poured with hand pots. In order to pour the crown it was necessary to pour the joint in laminations so that the tar would cool and form the crown of the joint to conform to the crown of the road.

A NOVEL LONGITUDINAL FLOAT

A novelty in the way of handles for the longitudinal float was found on this job. As the same float may be used by several different men in the course of a single season and the men's arms are not made the same length, the handles were adjustable. The plow handles were bolted at the bottom so that they could be raised or lowered at the outer end. The pieces of narrow strap iron were punched with holes so that by passing a rod through the holes at any desired spot the handles could be made the right height for a long armed or short armed man of the same height or for the rangy chap or the short thick-set man.

CURING

Iowa specifications require that the burlap be kept wet at least 24 hours after placing. When the weather is cool and the air still this is fulfilled by wetting down the last time at sunset and leaving the burlap until morning, but when the air is dry and windy, the burlap must be wet during the night. Oxweld Acetylene carbic lights were used on the shoulders to light the slab when night cover and sprinkling were in progress, and also for the men removing forms.

The slab was covered immediately after the burlap was removed by five men who shoveled from the shoulders. The Carr scarifier was taken back once a day to loosen the dirt ahead of the covering gang so there would be plenty of material without heavy hand digging. Three men sprinkled the burlap and cover as required. An Adams No. 12 grader was used to remove the earth cover at the end of the curing period.

WATER SUPPLY AT 450 POUNDS PRESSURE

Water for the project was supplied by a C. H. & E. No. 11 triplex pump on the banks of the Ocheyedan River at Spencer, the north end of the project, and from the Sioux River on the south end of the job. In order to maintain the required pressure at the paver, even with 3-inch pipe, it was necessary to pump at a pressure of 450 pounds at the pump. There were 7 miles of the 3-inch pipe, and then about 4½ miles of two 2-inch pipes from one of which the sprinkler hose was run. The other went to the paver. Taps for the paver were set at intervals of 200 feet and the paver carried

(*Continued on page 31*)

An All-Winter Bridge Game

By
Earl V. Murray
Ohio Department of Highways

Ohio Used Winter Bridge Construction to Relieve Unemployment

The Sign of Progress. New Bridges for Old and Jobs for the Jobless

JANUARY 22 marked the close of the greatest bridge game ever played in the state of Ohio and perhaps the country—it involved the expenditure of $3,553,708.15. Because of the acute unemployment conditions in Ohio, Gov. George White, early in the fall of 1931, set about the task of providing ways and means of relieving the labor situation.

Preliminary Work

A survey of all bridges on the state's system of 11,343 miles revealed the startling fact that there were many hundreds of bridges on the system too light to carry the legal maximum load and still hundreds more were classed as one-way structures. With this information the winter emergency relief bridge building program was conceived, the purpose of which was to provide work for thousands of worthy unemployed. Although winter construction is not uncommon in Ohio, no aggressive plan such as outlined had ever been attempted in the winter on either bridges or highways. The plan called for special specifications to insure first-class work, these being in addition to the general specifications covering highway construction. Heating of concrete materials were required as well as specifications designed for the protection of freshly poured concrete, curing and finishing. Timber structures likewise called for special attention as to treating, furnished from mills, cut to exact lengths, bored and shaped as per plans. These and many more details were only a part of the huge task of carrying the plan into effect.

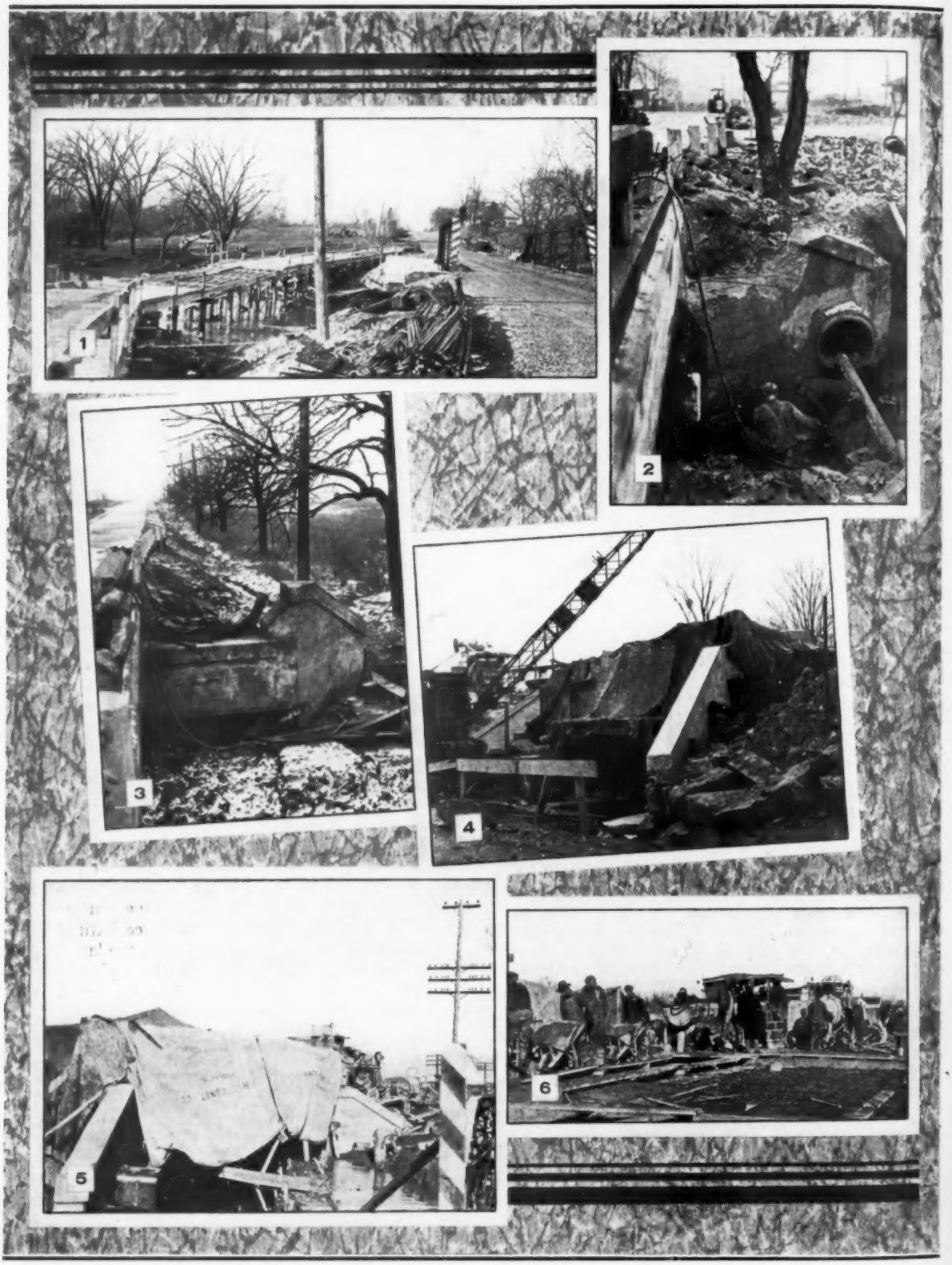
Work Started in November

The program called for the construction of 350 bridges of concrete and steel and timber design. In order that the program get under way at the earliest possible moment, a corps of some 30 skilled bridge engineers, in addition to the regular bridge bureau's personnel, were started to design and prepare the plans for these bridges. As a result of the rapid development of this emergency program, the first bridge contract sale was held November 6, and two or three lettings were held each month until January 22, 1932, the last letting. By this time exactly 349 bridges had been placed under contract, at a total cost of $3,553,708.15, and a task which seems almost formidable was finished.

Costs Were Reasonable

What ordinarily would have been performed in three or four years, was accomplished in three months. The purpose of the program was two-fold—to build much needed bridges during the prevailing low prices and at the same time provide legitimate employment opportunities for worthy jobless men. Although it was found that winter construction was necessarily more expensive, the moderate cost of building materials offset the extra expense and, therefore, the undertaking was justified.

That the unemployed would have the opportunity of work, a non-partisan local relief committee was organized in each county in the state. Its duty was to investigate all applicants living within the county, to determine their need for employment.



EXAMPLES OF CONSTRUCTION IN OHIO'S GREAT WINTER BRIDGE PROGRAM THIS PAST WINTER

1. A temporary run around, built of timber. The old narrow and weak structure at the right was replaced. 2. Extending on abutment for a widening project on Route 117, Allen County. 3. Similar work nearly completed. 4. A typical structure nearing completion "under canvas." 5. Curing a concrete superstructure with live steam from a regular tank car heater. A temperature of 70 degrees was maintained under the tarpaulin on this job on Route 31, Hancock County. 6. Pouring the concrete for a superstructure on a mild day.

SELECTED LABOR

The contractor was required to hire 85 per cent of his help from the list of men submitted to him by the relief committee. With but few exceptions, the entire scheme worked out to the complete satisfaction of the state officials. Bridges on this emergency program were located in areas where unemployment conditions were most distressing in order that the work would benefit those communities in the most urgent need of help.

FAVORABLE WEATHER

All bridge work was carefully inspected by a resident inspector and in addition to this, two traveling bridge inspectors were appointed to visit each project in their district to insure proper construction. The weather in Ohio during November, December and January favored bridge construction and with the exception of high waters, which caused some delay on several projects, the work progressed more rapidly and satisfactory than was anticipated. The average normal temperature was above freezing.

Although many of the bridges on this program are now completed, work is going forward on the balance and by spring the entire 349 structures will be completed and opened to traffic.

SUMMARY

Summarizing the undertaking we quote a recent statement of Director of Highways, O. W. Merrell: "Aside from providing work for the unemployed, the undertaking represents a worthwhile investment of public funds from the standpoint of safety alone, as many of the bridges on this program will replace weak and one-way structures."

Belt Conveyors Handle Muck of Subaqueous Tunnel

(Continued from page 23)

up to equal that in the inner one so that there would be no interruption of the decompression treatment of the first group admitted.

Either the medical director or one of his assistants is on duty at all times to examine men and visitors. "Bends" rarely develop in a man unless he has emerged from pressure too rapidly, according to Dr. M. E. McGarty, medical director of the tunnel project, and men do not get "bends" from working under a low pressure. If the bubbles of nitrogen which have been absorbed by the tissues get into the blood stream and work their way to the heart or brain or spinal cord, the result often is fatal. Mild cases of "bends" give rise to muscular pains in the joints.

The decompression process on the East Boston Tunnel is in accordance with Massachusetts regulations. The pressure is reduced from 21 pounds to 11 pounds in two minutes, six seconds; then eleven minutes, fifty-four seconds are allowed for the other 11 pounds to return to normal atmospheric pressure. A total of fourteen minutes is required in the man-lock when coming out

PERSONNEL

The East Boston Tunnel is being built for the Transit Department, City of Boston, by Silas Mason Co., Inc., New York. Colonel Thomas F. Sullivan is Chairman of the Transit Commission with Ernest R. Springer, Chief Engineer and Wilbur W. Davis, Assistant Chief Engineer in charge of the field work. H. Leslie Myer, Vice President and General Manager, Silas Mason Co., Inc., is in complete charge of all work for the contractor with Francis Donaldson as Chief Engineer and H. M. Buck as Job Engineer.

Industrial Railway on Long Iowa Paving Project

(Continued from page 28)

two 200-foot hose equipped with Quick-as-Wink connections.

FEW ACCIDENTS

The Henkel organization is justly proud of the remarkably few accidents that occurred on this job in spite of the large amount of machinery used and the maintenance of so much rolling stock. There were a few minor cuts and bruises, but no accidents that required loss of time to the men. Appropriate warning signs appeared at the batcher and on other pieces of equipment.

PERSONNEL

H. C. Grupp was Superintendent for the Henkel Construction Co. of Mason City, Iowa, on this paving project on which the high average of 1,200 feet of 18-foot slab, 10-7-10-inch section, per 12-hour day was maintained. For the Iowa State Highway Commission, P. T. Savage was Resident Engineer.

Not Mere Technicalities

AT a recent letting by the Massachusetts Department of Public Works the bid of the contractor submitting the lowest figure was declared informal and the contract awarded to the next bidder who was declared to be the lowest formal bidder. The attorneys for the disqualified contractor argued that the defects in its bid were mere technicalities.

The facts of the situation are set forth in *The Nerba*, the publication of the New England Road Builders' Association. The standard requirement in Massachusetts with reference to filling in proposal forms is:—"The bidder shall specify a unit price, in both words and figures, for each item for which a quantity is given, and shall also show the products of the respective unit prices and quantities written in figures in the column provided for that purpose and the total amount of the proposal obtained by adding the amount of the several items." There were seventy-one items on the project under discussion. Not a single item in the proposal filed by the disqualified contractor was filled out in the required manner. The unit prices on several items had originally been specified in both words and figures, but had been crossed out and new figures, without writing, substituted. The prices on numerous other items had originally been specified in figures alone, which were crossed out, and new figures alone substituted. On the balance of the items, the prices were specified in figures, but not in words. In the products column, figures were crossed out and other figures substituted.

The proposal was one that would have been declared informal by any awarding authority acting in accordance with sound and accepted rules applicable to the filling in of proposal forms. A bidding blank on a quarter of a million dollar project is no place to mess up figures or to write a cross-word puzzle. The Department was right in declaring the bid informal. The defects were not merely technicalities—they were fundamental defects.

Hot *and* Cold Mix *as* Needed

Pennsylvania Paving Company, Chester, Pa., Has Unusual Asphalt Plant

WHETHER it is hot mix or cold mix that the contract calls for the Pennsylvania Paving Co. is ready to produce at its Chester plant. The plant has a capacity of 200 tons of hot-mix binder or top and approximately 250 tons of cold mix bituminous concrete per 10-hour day. It is arranged to load into either trucks or railroad cars as the plant is located in a good sized lot on a railroad siding. The mixing plant straddles the track with a clearance of 13 feet 6 inches above the rails. The Pennsylvania Paving Co. does its own spotting of railroad cars with one of its several cranes.

All of the aggregate for either cold or hot mix is dried in an internally-fired rotary drier arranged with two furnaces, one at either end. For cold mix, the hot gases from the furnace at the intake end strike the cold and wet aggregates, passing through the drier and gradually cooling off as they reach the discharge end.

In this manner the aggregates are heated to a temperature sufficient to eliminate the moisture and are again cooled to a permissible working temperature. For hot mix the hot gases from the furnace at the discharge end counterflow over the aggregates again and leave the drier at the hottest point, assuring a higher temperature. The fan with a direct motor drive is mounted over the drier on a structural steel frame and is equipped with adjustable dampers at either end for controlling the flow of gases for either cold or hot mix. The drier is self-contained and portable so that it may be moved readily if necessary.

The mixing plant is of the semi-portable type with each section riveted and self-contained. As assembled it makes a rigid plant. The mixing plant contains a hot material elevator, a rotary screen of the open front type, a storage bin, weigh hopper, asphalt bucket and mixer. The elevator and screen are driven from a fully enclosed motor with a gear reducer and flexible couplings.

The 1-ton mixer is also equipped with a direct motor drive and is of the twin shaft pug mill type. It is equipped with manganese liners and combination cast steel and manganese paddles. The dumping gate is operated by a steam lever operated by a cushioned steam cylinder. All levers for the operation of the plant are in convenient reach of the operator.

The dust house is built next to the mixing plant with the floor on the same elevation as the mixer floor. Dust in bags is unloaded from railroad cars by a crane and hoisted direct to the dust house which has a capacity of about two carloads.

A 15,000-gallon asphalt storage tank and a 4,000-gallon melting kettle are provided with a steam-jacketed asphalt pump direct-connected to the steam engine and a steam-jacketed asphalt pipe line to the asphalt bucket and a return line to the storage tanks. A 10,000-gallon

(*Continued on page 56*)

The Hot and Cold Mix Asphalt Plant Installed by the Pennsylvania Paving Co. at Chester, Pa., in August, 1931

Care in Handling Reinforcing Marked Minnesota Paving Job

W. W. Magee Co. of St. Paul Used Ingenious Devices to Insure Proper Spacing and Placing of Steel and Joints

The Portable Telephone Set

IN Minnesota the placing and spacing of the reinforcing steel in the pavement slab varies from most other states, resulting in different devices for handling it. There are two ⅝-inch round bars 40 feet long through the center of the pavement, each spaced 6 inches from the center line of the slab. These are set 3½ inches from the subgrade and must be placed with bar chairs or removable bar supports. The latter method is chosen by most contractors. In this case bars bent to form a chair with the top at the required elevation and with a loop higher than that elevation to give a face for the bar to rest against were used. To remove the support from the concrete as soon as the bar was supported by the concrete a ½-inch bar handle 12 feet long was attached. This was always raised by one of the puddlers or the steel setters when concrete was poured so that the chair could be pulled readily. The two round reinforcing rods at the sides spaced 6 inches from the forms and 1¾ and 5½ inches below the top of the 9-inch slab were supported by removable bar supports. These were made of strap iron with hooks to hold the bars and a lug over the forms to space the bars properly, horizontally as well as vertically.

In addition to the chairs holding the center bars at the proper elevation, there were two spacers sliding along the forms to hold the bars the right distance apart and at the correct distance from the forms. These were made of light wood with steel clips to fit the steel and the forms.

The expansion joints of premoulded felt were made up ahead of the pouring with standard Minnesota-type placing shields with the required four dowels through each half of the joint. The dowels, each ¾ x 2 feet 6 inches long, were oiled and had a tinned steel dowel socket with a stop 6 inches from the end to provide space for movement of the dowel in case of its expansion after the pavement was completed. These dowels and sockets were wired to the lower longitudinal bar, and to the marginal transverse bars, two of which were placed across each half of the pavement. They were 9 feet 6 inches long and ⅝-inch in diameter.

Making Up the Batches

Both sand and gravel for the concrete were received in gondola cars by rail from Lakeland, Minn., and were unloaded to stockpiles or to the batching plant bins direct by an Osgood Victor crane with a 45-foot boom and a 1¼-yard Williams clamshell bucket. Blaw-Knox weighing batchers were attached to the wood bins made up by the contractor. There were two men in the gondola cars spotting the bucket and cleaning up. In addition, at the batching plant, were the crane operator and the batcher man.

Bulk cement was used and handled in a very direct manner with no lost motion. The cement dock was only one car in length, the only serious error in the layout of the plant. The cement handling crew consisted of

four men shoveling and wheeling and one man weighing and dumping. Immediately in front of the car door were the platform scales with covered beams and directly in front of the scales were the two dumping holes to the 2-batch trucks. The roadway for the trucks was depressed so that the truck bodies cleared the traps by about ½-foot as the trucks backed in. Canvas was hung from the traps so that the cement would not fly when dumped. A broom was kept handy so that the man weighing and dumping could sweep the scales and the traps frequently and not allow an accumulation of cement to interfere with the accuracy of the weighing. The batches, which were hauled by the fleet of International trucks, consisted of the following, a representative batch: 2,201 pounds of gravel, 1,502 pounds of sand and 659 pounds of cement. The fleet included eleven of the contractor's own trucks and a maximum of twelve hired trucks which were paid by the batch hauled.

A man at a distance of 100 feet from the cement plant covered the cement with sand when the wind was excessive. He also checked the time of the trucks, their numbers, and gave each truck driver a ticket which was the basis of payment for the hired trucks and gave a close check on the contractor's own fleet.

PREPARING THE FINE GRADE

The fine grade was prepared carefully for an average of 1,000 feet ahead of the paver. A Lakewood grade-rooter was used to cut the subgrade where it was high so that the earth could be easily handled by the Caterpillar Thirty with a Killefer rotary scraper and the Warco one-man grader which also cut the trench for the Blaw-Knox 9-inch forms. Four men under the direction of the fine grade foreman set the forms well ahead of the paver. From three to five men shoveled from the grade as required to trim it to the contour specified, for a pavement section 9 inches thick at the edge, tapering to 7 inches thick at a point 4 feet from the edge and uniformly 7 inches thick throughout the center section. A crown of 1 inch was specified. One man hand-tamped the forms, a point that is frequently overlooked in concrete road building. The forms are not inflexible and if there is any point in the base that is not supported the form will tend to flex at that point with a consequent slight depression in the riding surface of the slab. This is somewhat overcome by the use of the longitudinal float, but the practice of tamping the base of the forms is one worth following on all concrete work. A second man tamped part of the time on this job and also oiled the forms. The grade was compacted by a Huber 5-ton roller ahead of the paver. A Blaw-Knox turntable was used for reversing the trucks and was moved ahead, to keep it about 200 feet from the paver at the minimum, by a heavy chain attached to one of the trucks.

AT THE PAVER

The crew which put in the slab and cured it started with the man who spotted the trucks and dumped the batches into the skip of the Rex 27-E paver. The paver pulled a Koehring subgrade planer from which two men shoveled any excess earth. A little detail of their work was the use of long flat hoes made of plates of steel about 2½ inches high and 18 inches long with a steel bar for a handle. These hoes, used along the forms, left a clean smooth edge for the pavement slab and were much easier to use than a square end shovel for this work. The removal of the rim of earth against the form eliminated any chance of there appearing to be an undercut slab when the forms were pulled.

There were two men placing the steel with a helper who was a handy man. In addition the man who sprinkled the grade ahead of pouring also helped with the steel. The handling of the steel was described in considerable detail in the opening paragraphs of this article. Two men ahead of the paver laid out the steel dowels and made up the bars and dowels for the contraction joints.

There were two puddlers who also spaded the edges and shoveled to the strike-off of the Ord finishing machine as needed. The finishing machine pulled a 4-wheel trailer with a plow cutter to make the slot for the continuous center dummy joint. On the trailer there was also a hand cutter for the dummy contraction joints. This consisted of a heavy plank on edge cut to the crown of the pavement and equipped with plow handles. A blade fastened to the lower edge of the plank cut the dummy joint for the insertion of the bars or markers for the contraction joints. This was done by the men who handled the longitudinal float from a Lakewood twin bridge on rollers. On the front of the bridge was a cantilevered plank on which one of the men stood to place the removable center dummy joint markers. Thus he was free and not interfered with by any bridge or other piece of equipment. The expansion joints and dummy contraction joints alternated every 40 feet 4.5 inches. The second longitudinal float man ran the bridge forward with the hand ratchet, as the first man required, to place the center joint markers. When there were a sufficient number ahead and the bridge had been moved ahead one-half the length of the longitudinal float, the float was used across the center joint in finishing the surface.

Two hand finishers used long-handled floats to touch up any spots, then straight-edged the slab, belted it and finally used one belt to give it a uniform finish. One man on a bridge behind the finishers pulled the joint markers along the center and the dummy contraction joints and the caps on the expansion joints and edged all joints. A helper took the center markers, wedges and caps, cleaned them and oiled them, then took them ahead to the trailer where they were stored until re-used.

Two men spread the burlap and sprinkled it the first day. The following day one man with an Aeroil tar kettle poured the center joint, the dummy joints and the tops over the premoulded expansion joint. At this time two men were banking the edge of the pavement with earth and another applied the calcium chloride with a spreader on wheels.

When lip curb was being poured on one side three men handled the wheeling back of the concrete from the section where the puddlers were working, the placing of the forms and finishing the curb. The forms for the lip curb were steel channels so designed that they could be used for either a 2-inch or a 4-inch curb. They were attached to the steel pavement forms by an ingenious wedge device. Holes in the forms and the chan-

SEEING THE JOB THROUGH FROM FINE GRADE TO POURING THE SLAB

1. *Checking the fine grade with a scratch board.* 2. *Unloading gravel with an Osgood crane and Williams bucket.* 3. *The cement dock under which the batch trucks backed for loading.* 4. *The Rex 27-E paver delivering a bucket of concrete.* 5. *The hose connection and pressure regulator at the paver.* 6. *A removable double chair for holding two continuous round rods at the edge of the slab.* 7. *The type of removable chair with 12-foot handle used to support the center rods. Note the handle on the far side being held above the new concrete.* 8. *Placing an expansion joint with dowels and transverse steel.* 9. *The method of supporting the expansion joint with two-tined forks while pouring concrete.*

Waiting for Concrete for the Lip Curb

nel lip curb form coincided. Buttons with slotted shanks were pushed up through the slab forms and wedges slipped through and driven up with a hammer, holding the channel forms securely.

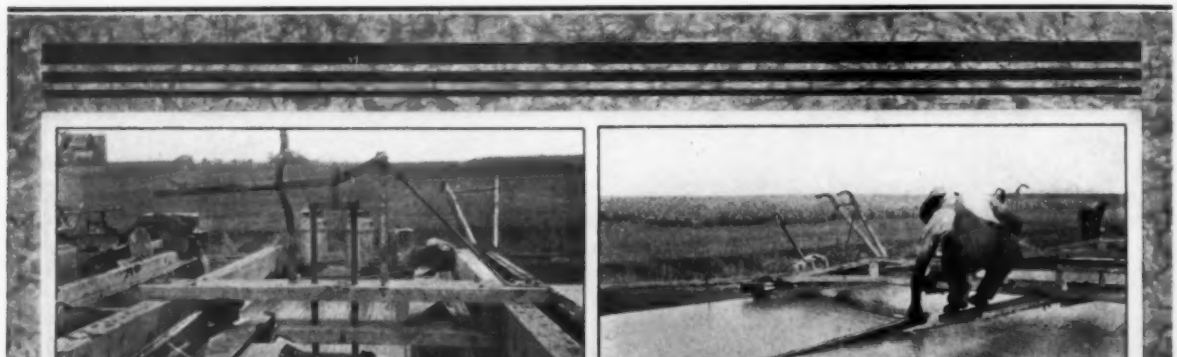
When setting the expansion joints a wooden right triangle was used with a string across the forms by which the expansion joint was trued. The concreting organization described was able to make the average of 1,200 feet of slab each 11-hour working day throughout the work in spite of the fact that this was the first concrete paving job this organization had done for the state. The materials were mixed a full 60 seconds.

TWO PUMPS FOR 8-MILE LINE

Two pumps were used on this job as the length of pipe was unusual. A Domestic triplex was used at the stream with a Jaeger as a booster on the line. For the first 4 miles a 2½-inch pipe was used followed by a 2-inch pipe. Taps were set into the line every 700 feet and the paver carried 380 feet of 1½-inch 6-ply hose. A connection at the paver made it possible to carry two hose which was done at times. The single connection was made up with two gate valves for the two paver hose and a third for the ¾-inch sprinkling hose.

PERSONNEL

This 9.83-mile paving contract was completed by the W. W. Magee Co. of St. Paul, Minn., with George V. Mork as Superintendent. For the State Highway Department, G. F. Barstow was Resident Engineer.



MARKING AND FINISHING CENTER AND TRANSVERSE JOINTS

1. The plow cutter on the 4-wheel trailer behind the finishing machine. 2. Placing a removable center dummy joint marker from a cantilevered plank on the front of the finishers' twin bridge. 3. At left is seen the finishing machine with the 4-wheel trailer carrying the center dummy joint cutter and the transverse joint cutter. In the center are the two "bull float" men finishing over the center dummy joint, and in the foreground the two hand finishers using straight-edges. 4. A section of center dummy joint after the markers had been pulled. 5. A premoulded expansion joint with the cap removed, ready for pouring.

A Practical Method of Figuring

Blast Hole Drilling Costs

The Expense Varies Greatly in Different Operations This Article Considers the Governing Factors

THE one important objective in figuring blast hole drilling costs is to determine the cost of drilling a given cubic unit of stone, either a ton or a cubic yard. This is obtained by dividing the number of tons or cubic yards of rock displaced by a given number of feet of drill hole into the total cost of drilling.

For instance, if 2,560 tons of limestone is displaced by blasting 80 feet of 6-inch drill hole and the expense of drilling amounts to $16.00, the drilling cost per ton would be approximately $.006, exclusive of explosive cost.

It will, therefore, be seen that it is quite an easy matter to calculate the drilling cost per ton of rock displaced by any given number of feet of drill hole, but first let us see how we go about to estimate the tons of displacement of a given cubic unit of rock. Perhaps the simplest rule is to multiply the centers of drill holes by the depth and weight of stone per cubic foot in the solid and divide by 2,000.

For example, with holes 15 feet on centers, we get an area of 225 square feet and with a 40-foot face this gives 9,000 cubic feet of stone. Multiplying by 160, the weight of limestone per cubic foot, we get 540,000 pounds or 720 tons.

Cost per Foot

Now that we have the number of tons of stone displaced by a given number of feet of hole, the next thing is to estimate the drilling cost per foot which is obtained by dividing the number of feet drilled in a certain time into the cost of operating the drilling outfit for an equal period.

Drilling costs will necessarily vary in different operations depending upon the kind and size of drilling outfit used, amount invested, labor conditions, kind of power, whether wire or manila cable is used, and if bits are dressed by hand or with machine.

DAILY REPORT OF WELL DRILL OPERATION

Name of Company

Location — Date

Drill Bit Size — Type — Angle

			DELAYS
Hole No.			1. Running bailer
Start	Stop		2. Changing bits
Total hours worked			3. Moving rig
Actual drilling time			4. Power off
Depth of hole			5. Tools stuck
DRILL OPERATING COSTS			6. Repairing
Operator	Hrs. @		7. Shooting
Helper	Hrs. @		8. Delay a-c weather
Tool dresser (if other than driller or helper)	Hrs. @		9. Dressing bits
Power			10. Fishing
Lubricants			11. Motor trouble
Cable Expense			12. Road making
Repairs and renewals			13. Splicing cable
Dressing bits			14. Waiting for bits
Overhead (depreciation, int., etc.)			15. Cleaning hole
Other expense			16. Waiting for supplies
TOTAL			17.
Number feet of hole drilled			18.
Feet per bit			19.
Cost per foot			20.

Remarks:

Driller — Foreman or Supt.

Figure 1. A Satisfactory Report Form for Drillers

We will consider each of these factors in the following order:

1. *Labor Expense.*—In operating a blast hole drill there is usually a driller and a helper employed, although there are many jobs where the helper can be dispensed with. This is particularly true in operating electric and gasoline traction machines, and on operations where the job of dressing bits is performed by a machine, making it possible for one man to keep enough bits dressed for several drills. The wages paid will vary from $4.00 to $12.00 per day, depending upon the experience and ability of the operator. A good blast hole driller is a valuable asset, and it is always better to pay more money to a good operator, a man who knows how to get results, than to employ an inexperienced man who gives no attention to details, and is only interested in putting in his time without regard to how much footage he gets per day, or what it costs.

2. *Fuel Cost.*—This depends upon the kind of power used and the size of the power unit. As gasoline and electric power are used most extensively for operating blast hole drills today, we will consider only the gasoline engine and electric motor in our analysis.

A gasoline engine will consume from 4 to 6 gallons of gas per 10 hours for a 6-horsepower single cylinder engine or 12-horsepower multiple cylinder engine, to 10 or 12 gallons for a 15-horsepower single cylinder engine or 20 to 25-horsepower multiple cylinder engine.

TWO AND ONE-HALF CENTS PER KILOWATT

Where electric power is used the cost will vary with the size of the motor and the rate per kilowatt-hour. A 15-horsepower motor on an ordinary load will use about 50 to 60 kilowatt-hours per day and, at an average of 2½ cents per kilowatt, the operating cost will range from $1.25 to $1.50 per each 10 hours operation.

3. *Depreciation.*—Depreciation is usually figured on the basis of 10 per cent per annum against the original investment, calculating 10 years as the average life of a blast hole drill, although some drills placed in service as much as fifteen years ago are still performing satisfactorily and are apparently good for several more years of active service. Obviously the depreciation on a steel frame drill is much less than a wood frame machine.

4. *Interest.*—In estimating drilling costs interest is usually figured at a rate of 6 per cent per annum on the amount invested, although this item will necessarily vary in different localities, depending on the money market and other conditions.

5. *Cable Expense.*—One of the big items of expense in the operation of a blast hole drill is drilling cable, especially where manila rope is used. It is usually necessary to replace a manila rope every 30 to 60 days, sometimes more often, depending upon the size and quality of the rope used, weight of tools, hardness of stone and the care given to it by the operator. A big saving may be effected by using wire rope.

For comparison we will take two different operations where the conditions are practically identical, using two drills of the same size and make, one equipped for manila rope and the other for wire rope. The results will be found to be approximately as follows:

DRILL NO. 1—USING MANILA ROPE

Total amount hole drilled, 8-month period	4,000 feet
Number feet 2-inch manila cable used (4 changes)	600 feet
Approximate cost	$240.00
Cable cost per foot hole drilled	.06

DRILL NO. 2—USING WIRE ROPE

Total amount hole drilled, 8-month period	4,000 feet
Number feet ⅝-inch C. C. steel cable used (2 changes)	300 feet
Approximate cost	$ 48.00
Cable cost per foot hole drilled	.012
Saving	$192.00

or almost 5 cents per foot for all holes drilled.

This saving does not take into consideration the elimination of lost time due to splicing and replacing manila rope, changing ends and sticking of drill tools which cause frequent delays in drilling with manila cable. The advantage, therefore, is decidedly with the wire rope user, and relatively few blast hole drills are sold today for operating with manila line.

6. *Maintenance.*—Under this item will be included the cost of repairs and replacements necessary to keep a drill in operation, which should not exceed 50 cents per day, including new machine parts and tools, exclusive of bit steel. This, however, does not include the time lost from breakdowns waiting for new parts and making repairs on a machine and tools. The more rugged the machine is built the less possibility of breakdowns and delays, and good judgment in selecting a drill that is strong and sturdy will eliminate many chances of delay from such sources.

7. *Drill Steel Bits.*—Good bits and plenty of them will do more to keep drilling costs down than any other factor in connection with the operation of a blast hole drill. It is the bit which actually makes the hole and it is impossible to expect to make fast progress in drilling where the bits are of incorrect design or are not kept dressed up properly. It is false economy to use a bit too long without sharpening. It not only retards progress but many a fishing job has resulted because a freshly dressed full-size bit had wedged in the hole due to running the previous bit after it had become undersized. There should be at least three bits with every drilling outfit to provide frequent changing and to eliminate lost time in waiting for freshly sharpened bits.

EIGHTY-SEVEN CENTS PER DAY

A 6-inch drill bit weighing 250 pounds at a delivered cost of approximately $35.00 may be sharpened 120 times during its useful life and the value of the steel dissipated each time the bit is used would thus be 29 cents. On a basis of three bits being used each day on each drill the cost for drill steel per day would be 87 cents.

8. *Bit Dressing.*—In estimating the cost of dressing bits it depends largely on whether this is done by hand with sledges or with a machine. A bit sharpening machine not only reduces labor costs 50 to 80 per cent over hand sharpening, but puts cutting edges on drill bits which experience has proved will actually cut 30 to 50 per cent faster than hand dressed bits.

SHARPENING COST

It is estimated that it costs about 42 cents to sharpen and harden a bit where a bit sharpener is used, including coke for fuel as well as interest and depreciation on the money invested. On the basis of three bits being used per day the cost of keeping bits sharpened for one drill would be approximately $1.26. This, of course, will vary with each particular operation. For instance, in drilling certain formations such as soft limestone it is often possible to run one bit an entire day or more without changing or resharpening; consequently the

expense of dressing bits will be less than in drilling hard formations such as trap rock or granite where sometimes it is necessary to change bits every hour or so, depending on the hardness and abrasiveness of the stone.

SUPERINTENDENCE

Another factor that enters into the cost of drilling blast holes is superintendence. In most quarries blast hole drilling operations are placed in charge of the plant superintendent or pit foreman, although in many of the larger operations a separate drill foreman is employed. In either case there is the general superintendent's or foreman's time to be considered, but which ordinarily would not be a very big item since in the big hole system of drilling and blasting a large amount of work can be planned ahead and assigned to the driller without further attention from the superintendent or foreman in charge of the quarry.

It would be difficult to make an accurate estimate of superintendence expense for each drilling job as this would necessarily vary in different operations. However, as a basis for making an analysis of costs we should say that 30 to 50 cents per 10-hour shift would ordinarily cover the average job, and this would also include any extra help employed about the machine.

FIGURES CONSERVATIVE

In the foregoing articles we have briefly analyzed the different factors that enter into the cost of blast hole drilling. We have tried to be conservative in our estimates, and while, of course, the figures we have complied will not apply to every drilling job they are accurate enough to enable any user of blast hole drills to determine approximately at least what his drilling is costing per unit of stone produced.

In this connection we have selected at random a number of representative firms using churn drills for blasting, and have given below operating data showing actual results obtained under widely varying conditions.

It should be interesting to note just how your drilling costs check up with other operations having similar conditions to meet.

OPERATION NO. 1—LIMESTONE

Location of quarry	Texas
Character of rock	medium hard
Purpose used for:	Making lime and for road material
Height of working face	60 to 90 feet
Character of quarry top	uneven
Daily plant capacity	2,000 tons
Structure of rock	seamy with large boulders
Method of loading	power shove
Drills used (3)	Armstrong No. 50-B traction
Power	22½-horsepower, 4-cylinder gas engine
Weight tools	approximatly 1,800 pounds
Size of drill stem	4¼-inch x 20-inch—2¼-inch x 3¼-inch joints
Diameter of holes	6 inches
Spacing of holes	20 x 12 feet
Average daily footage drilled (1 drill)	35 feet
Approximate tonnage removed per foot of hole drilled	19.2 tons

AVERAGE DAILY DRILL OPERATING EXPENSE (ONE DRILL)

Labor:	
Wages, driller	$ 4.00
Wages, helper	2.50
Lubrication and fuel cost, 10 gallons gas	2.00
Depreciation	1.00
Interest	.60
Cable Expenses—300 feet ¾-inch wire rope, 300 working days	.16
Maintenance—repairs to machine and tools	1.00
Bit dressing	.30
TOTAL Daily Operating Cost	$11.56
Drilling cost per foot	$ .33
Drilling cost per ton	.017
Method of blasting	single row
Kind of explosive used	40 to 60 per cent dynamite
Average amount of explosive used per hole	300 pounds
Average amount of rock removed per pound of dynamite	4 tons

OPERATION NO. 2—TRAPROCK

Location of quarry	Connecticut
Character of rock	very hard
Purpose used for	roads and building
Height of working face	75 to 150 feet
Character of quarry top	uneven
Daily plant capacity	2,500 tons
Structure of rock	quite seamy
Method of loading	power shovels
Drills used	Armstrong No. 50-BE electric traction
Power	15-horsepower electric motor
Weight tools	Approximatly 1,800 pounds
Size of drill stem	4¼-inches x 20 feet
Diameter of holes	6 inches
Spacing of holes	20 x 25 feet
Average daily footage drilled (1 drill)	18 feet
Approximate tonnage removed per foot of hole drilled	40 ton

RECORD OF DAILY DRILLING OPERATIONS AND COSTS

Name of Company _____ Location _____

Date	Drill No.	OPERATOR			HELPER			EXTRA HELP			Total Labor Cost	Power and Lubricants	Cable Expense	Repairs and Renewals	Dressing Bits	Overhead (Depreciation, Interest, etc.)	Dressing Bits	Other Expense	Total Costs	Total Ft. Hole Drilled	Drilling Cost Per Foot
		Hrs. Worked	Rate	Daily Wage	Hrs. Worked	Rate	Daily Wage	Hrs. Worked	Rate	Daily Wage											

Figure 2—A Summary of Daily Operations Taken From the Drillers' Daily Report Sheet

AVERAGE DAILY DRILL OPERATING EXPENSE (ONE DRILL)

Labor:	
Wages, driller	$ 8.30
Wages, helper	5.50
Fuel cost (electric motor) and lubrication	1.20
Depreciation	2.00
Interest	1.09
Cable expense	.21
Maintenance—repairs to machine and tools	.40
Drill steel (bits)	1.74
Bit dressing 6 to 10 bits per day	2.54
Supervision and extra help	.60
TOTAL Daily Operating cost	$23.58
Drilling cost per foot	1.31
Drilling cost per ton	.032
Method of blasting	single row and tunneling
Kind of explosive used	60 per cent gelatin
Average amount of explosive used per hole	2,250 pounds
Average amount of rock removed per pound dynamite	2.6 tons

OPERATION NO. 3—DOLOMITIC LIMESTONE

Location of quarry	Wisconsin
Character of rock	very hard
Purpose used for	roads, asphalt filler, agricultural uses and terrazzo work
Height of working face	38 feet
Character of quarry top	rather uneven
Daily plant capacity	2,000 tons
Structure of rock	quite thick bedded
Method of loading	power shovels
Drills used	Armstrong No. 45-B electric non-traction
Power	15-horsepower electric motor
Weight tools	approximately 1,500 pounds
Size of drill stem	4 inches x 20 feet
Diameter of holes	6 inches
Spacing of holes	12 foot centers
Average daily footage drilled (each drill)	40 feet
Approximate tonnage removed per foot of hole drilled	16 tons

AVERAGE DAILY DRILL OPERATING EXPENSE (ONE DRILL)

Labor:	
Wages, driller	$ 5.50
Wages, helper	4.00
Fuel cost (15-horsepower electric motor) and lubrication	1.40

Depreciation	.90
Interest	.54
Cable expense	.15
Maintenance—repairs to machine and tools	.40
Drill steel (bits)	.60
Bit dressing	.62
Supervision and extra help	.20
TOTAL Daily Operating Cost	$14.31
Drilling cost per foot	$ .36
Drilling cost per ton	.023
Method of blasting	double row
Kind of explosive used	gelatin dynamite
Average amount of explosive used per hole	350 pounds
Average amount of rock removed per pound dynamite	5 tons

OPERATION NO. 4—SANDSTONE

Location of quarry	Quebec, Canada
Character of rock	hard and abrasive
Purpose used for	concrete and rip rap
Height of working face	20 to 60 feet
Character of quarry top	level
Daily plant capacity	3,000 cubic yards (solid)
Structure of rock	solid with horizontal seams
Method of loading	power shovels
Drills used (9)	Armstrong No. 50-BE traction
Power	15-horsepower electric motor
Weight tools	approximately 1,800 pounds
Size of drill steel	4¼-inches x 20 feet long—2¼-inch x 3¼-inch joints
Diameter of holes	6-inches
Spacing of holes	15 foot centers
Average daily footage drilled (each drill)	30 feet
Approximate tonnage removed per foot of hole drilled	18.59 tons

AVERAGE DAILY DRILL OPERATING EXPENSE (ONE DRILL)

Labor:	
Wages, driller	$ 4.80
Wages, helper	4.20
Fuel cost (15-horsepower electric motor) and lubrication	2.25
Depreciation	1.30
Interest	.80
Cable expense	.12
Maintenance—repairs to machine and tools	.50
Drill steel (bits)	1.20
Bit dressing (6 bits per 8-hour shift)	3.06
Supervision and extra help	.40
TOTAL Daily Operating Cost	$18.63
Drilling cost per foot	$ .62
Drilling cost per ton	.033
Method of blasting	5 rows—staggered
Kind of explosive used	75 and 90 per cent gelatin
Average amount of explosive used per hole	350 pounds
Average amount rock removed per pound dynamite	1.78 tons

THE VALUE OF ACCURATE COST RECORDS

There are many good forms used by different companies to keep their blast hole drilling costs. The two forms reproduced are especially recommended and will be found applicable to almost any churn drilling job. Figure 1 is a driller's daily time record sheet which is used by the drill operator or his helper to report daily progress and for recording the time spent on various operations during each shift. This should be filled out and turned in to the foreman or superintendent at the end of the day's work, and is so arranged that if each operation is properly recorded and summarized the foreman or superintendent can tell at a glance the total number of feet of hole drilled each day, also the total amount of "actual" drilling time and the total amount of "lost" or unproductive time charged under the heading of Delays which together should equal the difference between the actual drilling time and total hours worked.

FIGURING "LOST" TIME

In calculating drilling costs it should always be remembered that time spent in moving, changing bits, replacing cable, repairing machinery, and so forth, is "lost" or unproductive time as far as making any hole is concerned. It is quite apparent, therefore, that the drill which can be operated with the least delay and lost time will drill the greater amount of hole at the lowest cost per foot.

The blanks under the heading Drill Operating Costs are usually filled in by the foreman or superintendent before the report goes in to the office, although it should be the duty of the driller or helper to indicate total hours worked by each man, fuel used (gallons of gasoline or number of kilowatt-hours if electric motor), amount of lubricants used (oil and grease), and so forth. Dressing bits may be omitted if this is done on the job by the driller or helper without employing any extra help.

INDIRECT EXPENSE

The labor costs of driller and helper as well as any extra help may be taken from the company payroll or the workman's time card. Under the item of Overhead would be included interest and depreciation on the drilling outfits and also superintendence and any other indirect expense.

Figure 2 is a record or summary of daily drilling operations and costs taken from the Drillers Daily Report Sheet and has space for all cost items both direct and indirect. This is kept in the office and forms a permanent record covering the expense of operating each drill per day, week or month.

The superintendent of any quarry or mine who insists on keeping accurate records of drilling operations and costs can establish a system of operation which will greatly increase the progress of drilling, by reducing unnecessary delays and converting this non-productive time to the "actual drilling time," which in the end will mean more hole drilled at a lower cost per foot.

ACKNOWLEDGMENT.—We are indebted to the Armstrong Manufacturing Co., Waterloo, Iowa, for the data on which this text is based and for the illustrations.

Skid-Proofing the Columbia River Highway

THE famous Columbia River Highway in Multnomah County, Oregon, was resurfaced for 32 miles last year. This road which is famous because of the magnificent scenery carries a heavy traffic and is included in the itinerary of almost all tourists who visit Portland. The highway was first improved in 1916, with 2 inches of bituminous concrete pavement on a crushed rock base. Although in excellent condition during the early years of its life, the pavement has gradually waved and roughened under the increasing motor traffic. The amount of asphalt used was in excess of present-day practice and, due to bleeding, the pavement has been extremely slippery in wet weather for a number of years. There are many curves and grades which have not made for safety.

The Oregon State Highway Department awarded a contract to the West Contract Co. of Portland for resurfacing 32 miles of this road with a non-skid surface 1⅜ inches thick at a cost of 31 cents per square yard. Construction was carried along a half-width at a time, with heavy traffic on the other half. In spite of this handicap from 3,000 to 5,500 feet were surfaced daily.

The resurfacing operations started with the application of a tack coat of 0.08 gallons per square yard of Bitumuls, an asphalt emulsion. Following this about 82 pounds per square yard of 1¼ to ¾-inch rock was spread, leveled with a road grader and by hand, and rolled lightly. Then 0.3 gallons per square yard of the same emulsified asphalt was applied, on top of which 35 pounds per square yard of ¾ to ¼-inch key rock was spread, trued up by brooming and rolled thoroughly. Another application of the emulsion at the rate of 0.53 gallons per square yard was made and covered with coarse concrete sand, with a maximum size of ¼-inch at the rate of 28 pounds per square yard. This was broomed, rolled thoroughly and then opened to traffic.

A few days' traffic threw the excess sand from the pavement and a well developed mosaic texture was exposed. The rolling of the key rock placed the flat surfaces uppermost with no sharp edges to cause excessive wear on tires. The sand did not increase the thickness of the pavement, nor fill the key rock to the top, but that which remains within the interstices thoroughly seals the surface.

New Concrete Over Old

J. A. Mercier Co. Had to Fight Two Obstinate Muck Holes with Explosives Under Fill

ONE muck hole 400 feet long and another nearby about 300 feet long caused considerable extra work on the J. A. Mercier Co. contract, just south of Flint, Mich., last summer. With the usual cussedness of muck the fill was placed on top, the muck came up on the sides and the fill subsided. After this had happened for some time, it was decided to shoot the stuff and get the settlement over with all at once. A Universal crane with a small pile-driving rig was used to drive 2-inch pipe through the fill to depths which averaged 30 feet. These pipes were driven about 10 feet apart. When each one was complete, one whole and two half sticks of du Pont 50 per cent dynamite were exploded to make a pocket at the bottom of the pipe in the muck. Then from twenty-five to forty sticks were placed in the pocket and the whole side shot at once. The fill over the muck would rise from 2 to 3 feet as the blast went off and then the whole would settle from 5 to 6 feet below its elevation before the blast. By this method a firm fill was secured. In one or two cases the pipes broke off in the fill and second attempts had to be made but in general the work progressed without any undue delays.

Some Old Concrete and Macadam Removed in Grading

In fills there were cases where both reinforced concrete and old penetration macadam were covered and eventually paved over on this project. Where cuts were necessary the shovels had to tackle old reinforced concrete that had been put down to stay and pavement breakers and "skull crackers" were used to make small pieces out of the slab so that the shovels could work to advantage. There was one Byers 1¼-yard shovel and an Erie ¾-yard gas shovel on the rough grade. These shovels, in regular excavation, exclusive of the concrete excavation, were able to average 1,000 yards of dirt moved in a 10-hour day. The contract called for the excavation of 180,000 yards of earth, 15,000 yards of borrow, and about 5 miles of 18-foot reinforced concrete road. On the concrete, a P & H crane with a drop-hammer was used very successfully. The fabric reinforcement was torn out by the shovel teeth and it was not heavy enough to require cutting or burning out.

On the fills, for which the hauls ran up to 1,000 feet, one Caterpillar Sixty and another Thirty, each with bulldozers, handled the trimming without any hand labor although there was one pit man with each of the shovels. A Galion grader with an 8-foot blade, hauled by a Caterpillar Sixty, was used to smooth the grade ahead of actual fine grade operations.

Fine Grading Progressed Rapidly

The job consisted of paving two 20-foot roadways 10 miles long and the widening of 2 miles of highway with 10-foot slabs on either side. All the paving was 10 inches thick.

The 10-inch Heltzel forms were set rapidly ahead of the paver, there being at least 600 feet of forms ready at all times. The trench for the forms was cut by a Ted Carr Formgrader as soon as the grade was set by the engineers and then the fine grade crew of twelve

PREPARING TO BLAST BENEATH A FILL OVER A MUCK HOLE

1. *Driving a 2-inch pipe preparatory to blasting. Note the difference in elevation between the foreground which has settled after the blasting and the grade where the crane is working. 2. A string of holes ready to be fired.*

to seventeen men took charge. These figures include all equipment operators on the grade and the form setters as well. A Lakewood subgrader was used to cut the grade to the proper elevation and was pulled by the Caterpillar Twenty power grader. A Buffalo-Springfield 7-ton gas roller was used to roll the grade to uniform bearing. It was interesting to note a soft spot, in the otherwise firm grade, in the vicinity of the sand stockpile. The water from the sand was constantly draining out and had made a very noticeable soft spot sharply defined within the limits of the stockpile adjacent to the grade. The steel forms were set by three men who set a very straight line and smooth curves.

THE BATCHER PLANT AT AUSTIN CORNERS

Sand for the concrete was delivered to the stockpile of the contractor at Austin Corners near the middle of the job by the material producers, Foley & Beardslee, of Pontiac, Mich. The sand and gravel, from the same producer, were delivered in dump trucks and also in trucks and trailers with side dump roll-over bodies. The aggregates were loaded into the Johnson bins by a Koehring crane with a 40-foot boom and a 1-yard Owen clamshell bucket. The individual batches delivered to the 2-batch trucks consisted of approximately 2,100 pounds of stone and 1,300 pounds of sand for a 6-bag batch.

The contractor used four of his own trucks for the minimum haul and added a maximum of nine hired trucks for the longer hauls. The trucks backed under the batcher for the loads and then drove forward to the cement dock where four men loaded the bags of cement onto the batch if the haul was long, requiring two other men to dump the cement before the batches were delivered to the skip. On short hauls the cement was emptied direct from the bags onto the batches at the cement dock.

The cement was delivered to the contractor's cement dock on the job by a hauling contractor using a fleet of heavy trucks and two trailers with each truck. The hauling contractor provided two men on the cement dock to help unload the bags. When the trucks and trailers were unloading, the contractor's men loaded the batches from the trucks and trailers to expedite matters.

No turntable was used for turning the trucks so they turned through the forms or on the first section of slab poured. To prevent damage to either trucks or slab, ramps were provided for the trucks to mount the slab where necessary. These were of heavy lumber and were moved along as required by the trucks themselves.

WITH THE CONCRETE GANG

The oiling of forms, which is quite frequently considered a part of the concrete gang work, was done by a man from the grading crew on this job. The men who handled the dumping of the trucks at the paver, and used a large wooden mallet to insure the complete delivery of the aggregate to the skip, also oiled the Ransome 27-E paver. Ahead of the paver one man unrolled the paper joint material used between the slabs to create a plane of weakness between them so as to localize cracks. He also trimmed the grade behind the double grade board pulled behind the paver. This drag board was made with pipe extensions to run on the forms and carried two bags of cement on each end to weight it down. When the paver moved ahead a man rode each end of the drag to be sure that it cut to the full depth of the forms.

There were three puddlers and two men with hoes to distribute the wet concrete. The latter also set the steel reinforcing which was placed 3½ inches below the top of the slab. After the puddlers came the Lakewood finishing machine which carried the concrete quite high on the strike-off. One man watched the strike-off and shoveled concrete to it if the roll dropped more than half way. Following the finishing machine were two hand finishers who floated the pavement, straight-edged it and edged the slab. Some of these operations were carried on behind the longitudinal center joint machine furnished by the National Steel Fabric Co.

A wheel on the finishing machine was forced down into the concrete on the first pass over the new material. This pushed the aggregate aside and left a clear slot for the insertion of the center joint material. On the second pass the machine finished right over the slot, leaving a smooth pavement. The joint inserting machine followed closely behind the finishing machine and was operated by hand. It carried a spread of burlap behind to give a uniform finish to the slab where it had been disturbed which was then smoothed by the float of the man inserting the joint material.

The process of inserting the longitudinal joint following the cutting of the slot by the finishing machine was as follows: the operator spread the slot with a hand tool sufficiently so that the 5-foot strips of ¼-inch x 3-inch preformed asphaltic material could be inserted with no difficulty. He then pounded the strip down even with the top of the finished slab, using his float and finally floated the concrete on either side of the strip to even it up.

In setting the expansion joints every 100 feet a bulkhead of two pieces of 4 x 10-inch plank 10 feet long was set with four stakes behind it. Each section of

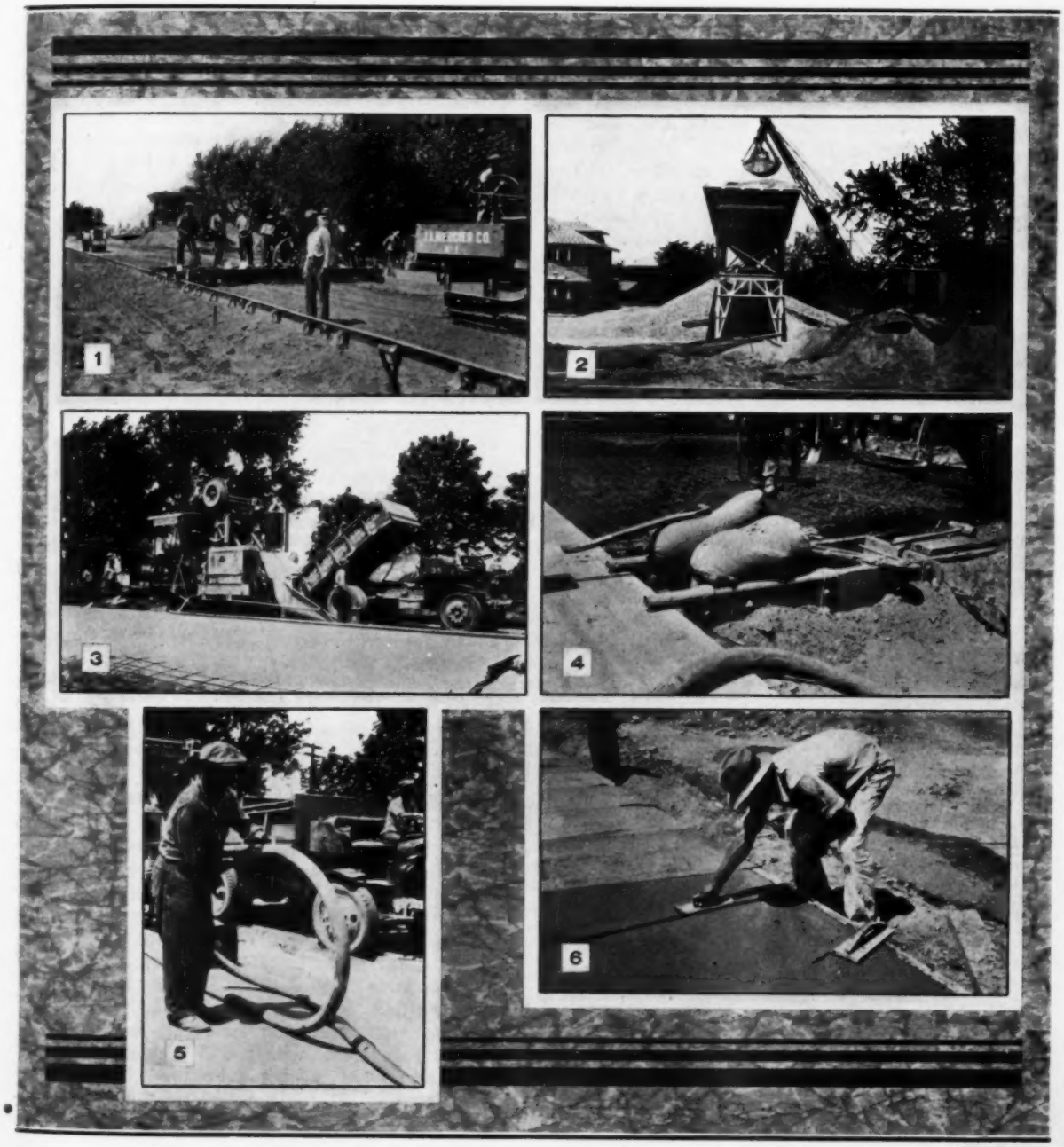
the bulkhead had a clip at the outer end to facilitate its removal from the concrete after it had been concreted in on both sides.

Following the hand finishers there were two burlap men and one sprinkler, one man who spread the hay for curing and two men sprinkling the hay.

WATER SUPPLY

The water supply for the paver and for curing was furnished by a Simplex triplex pump set up on the bank of a small stream and delivering the water through a 2½-inch pipe line with taps set every 400 feet. The paver carried 250 feet of 2-inch Continental 6-ply red rubber hose. This was regularly rolled ahead every time the paver moved forward and carefully coiled or laid along the shoulder and protected from trucks with two 2 x 6-inch planks. This method of moving the

(Continued on page 46)



DETAILS OF OPERATIONS OF THE J. A. MERCIER CO. SOUTH OF FLINT, MICHIGAN

1. A Lakewood subgrader trimmed the fine grade speedily when pulled over the forms by the Caterpillar power grader. 2. The Koehring crane loading the Johnson bins from the adjacent stockpiles. 3. An Autocar batch truck delivering the aggregates to the Ransome paver. 4. Detail of the planer pulled by the paver. Note the additional loading with cement bags and the pipe supports on the adjoining slab. 5. The Mercier organization believes in sparing the hose so it was moved forward by rolling in this manner. 6. The hand finisher working on an expansion joint.

The Editor Comments—

Only the Most Progressive Can Profit

Contracts awarded for highway and bridge construction in 1932 have been fewer than for many years and the prospects are that the dearth of contracts will continue. This means that only the most progressive contractor who is able to handle his work most economically can possibly be the low bidder. To be the low bidder without profit is no honor nor satisfaction. The day when contractors bid low on a job "just to keep the organization going" is past, for cash reserves have vanished. Better methods, legitimate short cuts and new ideas are what every contractor needs. Readers of CONTRACTORS AND ENGINEERS MONTHLY should study its pages with greater care than ever before to take advantage of new and more economical equipment, methods which other contractors have used and which can be adapted to their own organizations, and particularly the Department, "How the Other Fellow Did It." Only a few days ago a western contractor wrote for further details on one of the items, stating that while he was not doing that type of work at the present time, he wanted to be prepared with the best methods possible the next time a job of that type arose.

What of the highway field? Many contractors' hearts beat a bit faster when the Federal House passed the $132,500,000 emergency road construction bill. Unfortunately the White House and Congress seem no longer able to cooperate and the much needed emergency road construction bill, according to Secretary Hyde of the Department of Agriculture, will be vetoed by the President when it reaches his desk. He claims that instead of 350,000 men being employed on highway construction it will provide jobs for only 55,000. Figures of the American Road Builders' Association which has carefully studied the highway situation as a means of unemployment relief, are much more in accord with those of the sponsors of the emergency road construction bill than with the painfully small figures given by Secretary Hyde. It is unfortunate that the Administration should have so reversed its stand with regard to the advantages of highway construction as a means of alleviating unemployment. In 1931, an Administration-sponsored bill was passed and greatly aided employment throughout the country. The Democratic-sponsored bill of 1932 does not meet with the approval of the same Administration.

At this writing no definite statement has come from President Hoover, an Engineer and Administrator, big enough, we hope, to accept an emergency construction bill even though it is sponsored by his political opponents.

Highway Use Continues to Increase

A recent report of the National Automobile Chamber of Commerce holds great encouragement to the Road Builder for it shows that the highways of the United States were used more per car in 1931 than ever before, despite the fact that commerce and industry were in the doldrums during the latter part of 1931. The report states:

"This claim is supported by gasoline consumption records which indicate unmistakably that 500,000,000 more gallons of motor fuel were consumed last year then in the record year of 1930. Accepting this figure, we are justified in assuming that the nation's fleet of 26,000,000 motor vehicles exceeded their aggregate mileage of 1930 by more than 8,000,000,000 miles. In other words, each car and truck traveled an average of 300 miles farther last year than they did the preceding year.

"Nor was gasoline consumption the only record established by motor vehicles in 1931. Increased mileage translated itself into increased gasoline tax revenue which was used to finance a more extensive highway construction and improvement program than this, or any other country, had ever before attempted.

"Incomplete reports indicate that these added tax receipts made possible the expenditure by federal, state and local governments of $2,400,000,000 for highway extension, improvement and maintenance—almost $200,000,000 more than was spent for the same purpose in 1930."

More Hangovers

"Skinners," what are they? If you are from the South the first thing you will think of will be "mule skinners," and correct you are, for the term undoubtedly started with the old drivers who literally "skinned" their obstreperous mules. How frequently one hears the statement "a nigger's the best mule skinner." The term "skinner" is now truly a hangover, for we have "Cat skinners," "Dinky skinners," "Mormon skinners," and many another skinner referring to anyone who operates some particular piece of equipment or device.

Bringing up the name "Mormon" makes me feel that I should make a confession. The term applied in construction had never reached me before until traveling with Clyde W. Drew, a grading contractor of Omaha. Neb., I began to hear of "Mormon teams." One hates to appear ignorant, so I searched around for the meaning of the term, watching the Mormon teams as they were pointed out. At first I thought that they must be some 3-up hitches with two of the female and one of the male variety of horse, but the Mormon teams that came onto the horizon were all 2-up, and hence they could not qualify. An explanation with a laugh was soon forthcoming from Clyde Drew, and we then knew the term "Mormon" referred to the type of grading or spreading device used and not to the married state of the team.

Theodore Reed Kendall

Building *a* Small Bridge

on the

Western Illinois Bottomlands

Clinton Engineering Company

Completed Structure

from Piles

to Deck Slab

in Just Two Months

BETWEEN June 1 and August 1, 1931, the Clinton Engineering Co. of Clinton, Ia., built an interesting, though small, concrete bridge of 24-foot span on the bottomlands between the Green and Rock Rivers, on State Route 82 in western Illinois, in a location where no facilities were available for the easy hauling of materials or equipment. The work was handled in the middle of a long fill of sand and black topsoil on a relocation of an old road.

Moving in during the first week of June, the contractor started at once the excavation of the saturated sand with a stiffleg derrick handling the ½-yard tip-over buckets which were loaded by hand shoveling. The 2 x 6-inch wood sheet piling in 10-foot lengths was driven around the entire footing section, using a total of 451 pieces, 2 x 6 D. & M., of lumber to complete the 200-foot periphery. A Chicago-Pneumatic hammer was used for driving the piles and the air was furnished by a C-P portable air compressor. As work proceeded the excavation was kept dry with a Novo double-diaphragm pump. The wood sheet piling was supported laterally by three sets of wales of 6 x 6-inch lumber.

The foundation for the structure was two groups of 52 piles each 20 feet long with an 8-inch tip and 12-inch butt, driven with a drop hammer handled by the stiffleg derrick and operated by a Brownhoist winch. The driving was straight work with no jetting and although the work was not easy in the saturated sand, still there were no obstacles such as rocks or hardpan to hinder the driving. The piles were cut by hand at the approximate elevation of the footings.

The footings for this skew bridge, of 24-foot span and carrying a 40-foot roadway, were 9 feet wide for the wing walls and 5 feet, 6 inches under the abutments. The wing walls measured 18 feet and 10 feet, 6 inches long on either side. They were 18 inches thick at the bottom and 12 inches at the top, and the abutments were uniformly 12 inches thick from top to bottom. Forms for the footings as well as the superstructure were erected by a crew of two carpenters and fourteen laborers. The form lumber was all 1 x 6-inch stock and was held with wire ties. After the wing walls and the abutments on both sides of the stream were completed, the forms for the roadway slab were erected on fourteen piles driven in the stream bed. After the concrete was cured, the forms were stripped and the piles sawed off as low as possible in the stream by hand. For curing, the concrete was covered with burlap and sprinkled with water for seven days. Water for the

The 10-S Concrete Mixer with a Skip Extension to Ground Level

Pulling the Wood Sheet Piling Behind the Abutment and Backfilling by Hand

curing as well as for the concrete was furnished by a Meyers force pump.

HANDLING THE CONCRETE

All the aggregates for the 245.7 cubic yards of concrete in the completed structure were hauled in by truck and dumped in two stockpiles, well barricaded and on plank flooring to prevent waste and mixing of the aggregates with the sand and topsoil. A total of 27,940 pounds of reinforcing steel was used in the structure. The deck slab was 20¾ inches thick at the crown and 16¾ inches thick at the edges.

The same concrete mix was used throughout the entire structure instead of the older practice of a leaner concrete for the footings. The batches were made up of 188 pounds of cement, 436 pounds of sand and 633 pounds of gravel for the Marsh-Capron 10-S mixer. All materials for the batches, except the cement which was used direct from the bags, two of which were dumped into the batch for each mix, were weighed on a Fairbanks-Morse wheelbarrow scale. Two men wheeled the concrete away from the mixer and seven were required to handle the wheelbarrows of dry aggregates to the skip which was extended so as to permit the mixer to be set up on a cribbing of lumber. Two Sterling concrete carts were used to wheel the mix to the forms.

As soon as the forms were stripped and the burlap applied the wood sheet piling was pulled by hand using a mechanical jack.

PERSONNEL

For the Clinton Engineering Co., the work was under the immediate charge of E. A. Burke and for the Illinois Division of Highways, Construction Department, the work was supervised by J. B. Conroy, Resident Engineer.

An Interesting Situation in Salt Lake City

Many attempts have been made recently in cities and states all over the country to divert for unemployment relief, money appropriated for other purposes. Because of the frequent agitation in times of stress for such use of special public funds, a recent ruling of the Utah Supreme Court, stamping diversion as illegal, is of particular interest.

The decision was made on a writ of prohibition asked by a local taxpayer to restrain Salt Lake City Officials from awarding contracts for sewer construction in which certain special provisions were made for the benefit of the city's unemployed workmen. The contracts required, among other things, that all work be done by hand labor, that only local men be employed, and that crews be rotated so that as many men as possible could be given work. The city anticipated that these provisions would increase the cost of the project about ten per cent.

The ruling point in the decision was that the law and the constitution provide that money appropriated for one purpose cannot be diverted to other uses. The opinion held that a bond issue of $600,000 passed a few months previously provided funds for the construction of a storm sewer; but that in view of the provisions for hand labor and rotation of labor in the contracts, the cost would be about $55,000 more than the cost would be if the jobs were awarded by straight contract. Although recognizing that the motives in letting work on the basis outlined were of the highest, the Court held that in effect $55,000 of the bond issue was going, not to build a storm sewer, but for charitable purposes. This was directly opposed to the principle that money cannot be diverted from the purpose for which it is raised.

In the Court's decision exception also was taken to the provision specifying wages to be paid and requiring that only Salt Lake City men who were heads of families should be employed. In these regards the opinion reads, "There is in this state no expressed or implied power conferred upon a municipality which directly or by implication authorizes a city to dictate to a contractor, the wages he shall pay his employee. . . . The city in letting the contract has imposed conditions that preference be given to Salt Lake City men who are heads of families. It is obvious that by so doing the city imposed a preference not embraced nor included in the statutes and contrary to the statutes. These provisions of the contract cannot be sustained."

New Concrete Over Old

(*Continued from page* 43)

hose ahead has been noted on several jobs lately and certainly saves wear on the hose over the old method of just dragging it along as soon as the loop becomes taut.

A small Standard Oil Co. of Indiana tank truck supplied all the equipment on the job with gas by contract, every operator signing for the gas supplied to him.

PERSONNEL

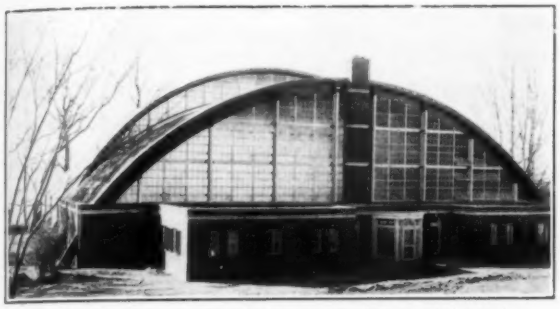
The J. A. Mercier Co. of Detroit, for which Frank J. Knight is General Manager and C. R. Kincaid, General Superintendent, was the contractor for this long concrete job on which the average paving for the 11½-hour day was 900 feet of 20-foot slab, 10 inches uniform thickness. Charles C. Leduman was Superintendent for the contractor, with C. H. Cash, Project Engineer and C. L. Cowgill, Resident Engineer for the State Highway Department of Michigan.

Tin Hats for Laborers

THE fact that there has been some labor disagreement in the past at Boulder City, Nevada, near where the Six Companies, Inc., are building Boulder Dam is not the reason that a large number of the men are wearing war time "tin hats." Fifty dozen of these hats have been ordered for the workers on the job, some of whom will not be allowed in the canyon bottom without them. Falling rocks have caused too many head injuries to date. This is a new note in accident prevention on construction work and might well be followed on many other jobs including tunnel work where there is danger of falling rocks from the roof.

The Consulting Engineer

New Buildings for Athletics

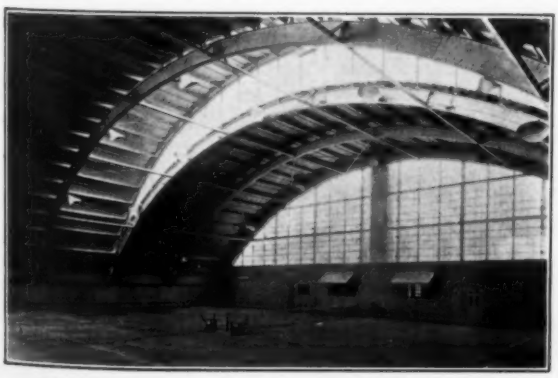


The Trajectory Tennis Courts Building, with Clubhouse in Foreground, Near Oyster Bay, N. Y.

Designed in the Office of Gavin Hadden, New York City

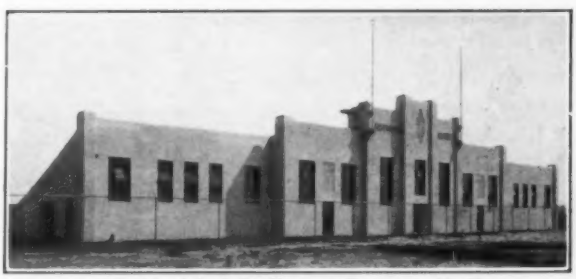
THREE distinctive athletic buildings have recently been designed by GAVIN HADDEN, Civil Engineer, 607 Fifth Ave., New York City. These projects, which are shown in the illustrations, are an indoor tennis courts building near Oyster Bay, L. I.; the first unit of a gymnasium at New York University, New York City; and a municipal stadium at Freeport, N. Y.

The tennis courts building is of the trajectory type, the design for which was originated by Mr. Hadden. One of the previous buildings of this type, housing one court, was described in the April, 1931, issue of THE CONSULTING ENGINEER, and in this two courts building, the problems of headroom and lighting have been solved in the same economical and novel manner. A new feature is the monitor over the center of the building which provides the additional light desirable for the two courts. It is so designed that no direct light from a given side of the monitor can be seen by anyone playing on the corresponding court below. The courts room is heated to provide comfortable playing conditions at all times and is lighted by twenty floodlights for night play. The surface of the courts is a clay mixture. The building also contains locker and shower rooms, a central lounge with observation windows overlooking the courts, and a caretaker's apartment.



The Interior of the Tennis Courts Building, Showing the Two Courts and the Method of Lighting

The New York University Gymnasium. A Drawing of the First Unit with a "Ghost" of the Future Building Superimposed



The Municipal Stadium at Freeport, N. Y.

The illustration of the New York University Gymnasium shows a drawing of the completed first unit superimposed upon a "ghost" of the future building. This initial unit includes a playing floor for basketball and other games, locker, toilet, shower and toweling rooms, offices, classrooms, study and student activity rooms. The future complete gymnasium will provide an extension of these facilities and such additional ones as swimming pools, special exercise rooms, general locker rooms and home and visiting team suites. By economy in design and construction and by the omission or postponment of all non-essential details, the uni-

(Continued on page 48)

Consulting Briefs

J. P. Snow, 18 Tremont St., Boston, Mass., reports that he is at present working on a report for the valuation of a toll-bridge for the determination of a fair rate-base and recently he appeared as an expert witness in a suit for the reduction of tolls on the above mentioned toll-bridge. Mr. Snow is a consultant on all matters connected with bridges, grade crossing eliminations, railroad terminals, port developments and public improvements generally.

James E. Geissberger, 103 Park Ave., New York City, reports that he is now working on plans for the construction of a bottling plant for Loewer's Brewing Co. and an 8-story garage over the New York Central Railroad tracks at 64th and 65th streets and West End Ave., involving about 7,000 tons of heavy structural steel. Recently he furnished the design for a bottling plant for Schaefers Brewing Co., as well as a 6-story stockhouse for the same company.

W. B. Rollins & Co., 339 Railway Exchange Bldg., Kansas City, Mo., report that they are now working on plans for an electric light and power plant and system for Lee's Summit, Mo., and for complete water works and sanitary sewerage systems for Deepwater, Mo. Under their supervision a water works system is being installed in Maysville, Mo., at an approximate cost of $50,000, including an impounding reservoir, a 300,000-gallons per day filtration plant, two raw water and two filtered water pumping units and a complete distribution system. At the Missouri Water and Sewerage Conference held at Jefferson City in October, 1931, a paper entitled, "New Methods of Financing," was read by W. B. Rollins.

J. R. Pennington, 890 William Glen Way, San Jose, Calif., reports that he recently prepared plans for the continued work on a pure public water supply for the City of Fallon, Nevada, which is an underground supply. Two test bores exposed excellent water, and plans and specifications for development were made and are being carried out under the supervision of Mr. Pennington. Heretofore the water supply for the City of Fallon came from shallow wells in a river bed giving water that was hard and having a very bad taste and odor. The new supply from deep wells is very soft and pleasant to the taste. The complete works is estimated to cost approximately $35,000.

Alfred Tamm, Harlingen, Texas, reports that at present he is working on plans for the Cameron County Water Control and Improvement District No. 19 to be presented for approval to the Board of Water Engineers of the State of Texas, at an estimated cost of $980,000. Under his supervision canal lining and pipe line work is being carried on in Hidalgo County Water Improvement District No. 6. A paper "Concrete and Gunite Lining of Irrigation Canals in the Lower Rio Grande Valley of Texas" was presented by Mr. Tamm at the fall meeting of the Texas Society of Civil Engineers in October, 1931, at Laredo, Texas.

The Thompson & Lichtner Co., Inc., Consulting Engineers, Statler Bldg., Boston, Mass., wish to correct an erroneous impression which might have been drawn from the item "Boston Engineers Report a Diversity of Projects" which appeared in the December issue of THE CONSULTING ENGINEER. This company, as consultants for the owner, supervised the design and construction of the Whitehead Building, Cambridge, Mass.

The Pleasure Pier Bridge of the Rolling Lift Type, at Port Arthur, Texas

Consulting Engineers Report on Bridge Projects Here and Abroad

ACCORDING to a report from Craig P. Hazelet, President and Chief Engineer, the SCHERZER ROLLING LIFT BRIDGE Co., Chicago, Ill., this company completed during 1931 the DuWamish River Bridge, King County, Wash.; the Peace River Bridge, for the Florida State Highway Dept.; the Thames River Bridge for the City of Chatham, Ont., Canada; an inland waterway bridge for the Tidewater Power Co., Wilmington, N. C.; and the Pleasure Pier Bridge, Port Arthur, Texas. Bridges now being constructed under the supervision of this company include the Franklin Street Bridge, Michigan City, Ind.; the Lawe Street Bridge, Kaukauna, Wis.; and Chukiang River Bridge, Canton, China; five combined railway and highway spans at La Havre, France, and La Vega de Triana at Seville, Spain.

This firm is also designing five movable spans, varying in length from 168 to 175 feet and from 40 to 66 feet width, for the Illinois Division of Waterways; a movable span 136 feet long and 52 feet wide over the Manistee River for the Michigan State Highway Dept.; a double-track movable span 94 feet long over the Harvey Canal, La., for the Texas & Pacific Railway and a movable span of 71 feet with an approach span 163 feet over the Tam River, China, for the Sunning Railway.

New Buildings for Athletics

(*Continued from page 47*)

versity obtained about 36 per cent of the total building, by volume, for only about 19 per cent of the total cost originally estimated.

The Freeport Stadium is of reinforced concrete, seating 2,000 spectators. A well equipped covered press stand is incorporated as a central feature of the architectural design. Beneath the seating deck are two team room suites, a director's office, a heating plant and spectators' rest rooms. The play fields include baseball and football fields, a quarter-mile track, jumping pits and six tennis courts.

Other work connected with athletics which has been completed by the office of Gavin Hadden during the past year includes eight permanent buildings at the Yale Bowl for spectators' conveniences, a community athletic field for Litchfield, Conn., and athletic fields and playgrounds for schools in Windsor, Conn., and Great Neck, N. Y.

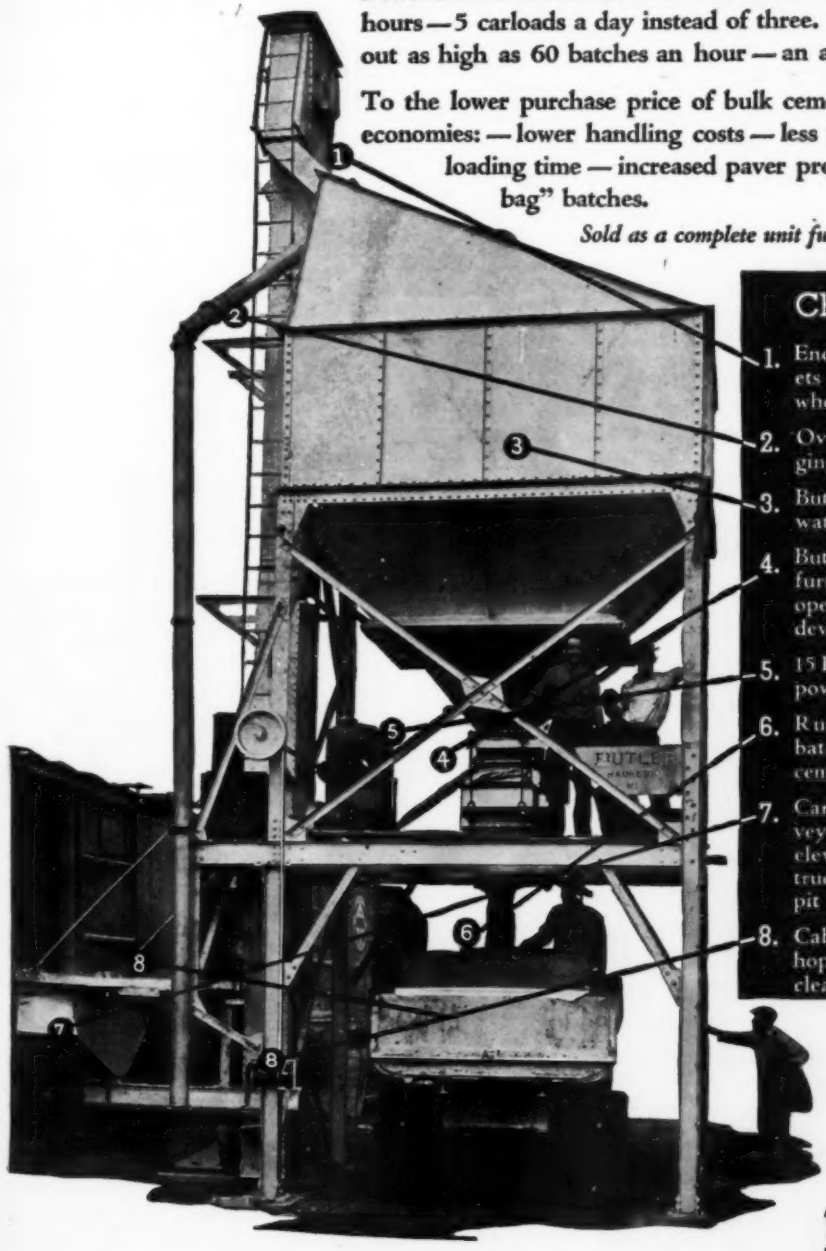
A BATCH A *MINUTE*

Butler Bulk Cement Plant "Steps Up" Paver Production

This complete portable unit... consisting of Storage Bin, Weighing Batcher, Power Shovel and Elevator... unloads a 300 bbl. car of bulk cement in 2½ hours—5 carloads a day instead of three. On actual jobs it has weighed out as high as 60 batches an hour—an average of "a batch a minute."

To the lower purchase price of bulk cement it contributes these further economies:—lower handling costs—less waste of material—less truck-loading time—increased paver production thru the use of "split-bag" batches.

Sold as a complete unit fully covered by the Butler guarantee.

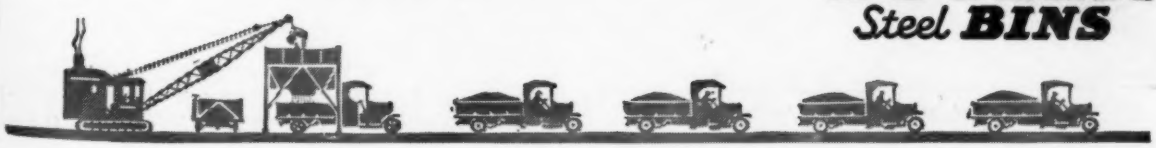


Check These Features

1. Enclosed Bucket Elevator—buckets do not have to be removed when elevator is moved.
2. Overflow Spout, prevents clogging of elevator when bin is full.
3. Butler Portable Cement Bin with water-tight steel roof.
4. Butler Cement Weighing Hopper, furnished with either manually operated or automatic weighing device.
5. 15 H. P. Gasoline Engine, operates power shovel and bucket elevator.
6. Rubber Discharge Spout from batcher to truck, prevents loss of cement thru blowing.
7. Car-door Hopper and Screw Conveyor, conveys cement to base of elevator. Easily converted for truck hauling of bulk cement. No pit required.
8. Cables and Winch, lift car-door hopper and screw for switching clearance.

Distributors in over fifty cities.
BUTLER BIN CO., Waukesha, Wis.

BUTLER
***Steel* BINS**



How the Other Fellow Did It

Construction Briefs

"Shoot the Chutes" for Cement Bags

140. Handling 94-pound bags of cement is a tiring operation. In most cases the bags come packed in freight cars, are stacked on hand trucks, wheeled and then either swung off the pile onto the batch trucks or the entire stack of bags tipped off at one operation. An ingenious method of handling cement bags by gravity was noted on a New England job. The box cars of cement in bags were spotted above the cement shed which was built on the side of the hill. One man in the car slid the cement, which was in paper bags, down a chute toward the cement house. He kept the chute filled and the slope was at such an angle that the bags just moved of their own weight until they reached a short horizontal section of the chute just above the floor of the shed. Here they stopped. One man in the shed stood with his back toward the delivery chute from the shed to the truck below and looking between his legs and down the chute he could see when the batch was spotted accurately at the end of the chute. He gave each bag a little push and set it on its way to the truck below.

A second chute on the far side of the shed was used when cement was being delivered from storage. The platform or horizontal section of the initial chute from the box car served as a loading point for hand trucks which were used to move the bags for storage in the shed when the cement was received faster than required on the job and demurrage was imminent. 21.6.51

Burlap Carried on Pipe Rolls

141. Numerous methods of handling the burlap which is spread on concrete road slabs immediately after finishing to prevent hair cracking have been devised by contractors. Some merely fold the strips and spot them along the shoulders, others fold them in a more orderly manner and carry them forward on rolling bridges. One method developed by a West Virginia contractor has been very advantageous and saved a great deal of time. The burlap was carried in 50-foot strips, rolled on a 2-inch pipe with a 12-foot piece of 1-inch pipe through it to carry it by and allow it to unroll. This roller was supported above the slab, before being placed, on X-shaped timbers with a third leg hinged on to make the supports stand alone as shown in the photograph. When the end of a strip of burlap was reached it was tied down to the forms so that the wind could not blow it up and expose the green slab. 22.1.80

Tripods and Rollers for Burlap

Keeping Oversize from the Crusher Grizzly

142. A contractor who found it necessary to haul sand and gravel a distance of 200 to 300 feet from a pit to the crusher adopted a novel method of eliminating handling oversize at the crusher grizzly. A sloping rail grizzly was built on the shuttle truck so that when the shovel loaded the trucks the oversize stone rolled off the grizzly. The rear end of the grizzly was a sufficient height above the truck body to permit easy dumping at the crusher. 21.4.65

Use Your Bulldozers to Move Stumps

143. On a New Jersey highway contract some rather large trees were encountered along the right-of-way, the stumps of which were loosened with small charges of dynamite and then pulled out with a crane and ¾-yard bucket. Where the stumps were too heavy for the crane, a 60-horsepower tractor climbed up into the woods and pushed the stumps over into the cut and then pushed them along with its bulldozer to the fill. Brush was similarly handled, some of the stacks which were pushed along being the equivalent of eight to ten large truck loads. 21.3.66

Keep Plenty of Men in the Fine Grade Crew

144. There is still ample opportunity for contractors to make good use of hand labor for paving operations. We have seen plenty of jobs where there were just enough men in the fine grade crew to keep things going just ahead of the paver. A Pennsylvania contractor who was operating an unusually well organized job regularly carried 25 men in the fine grade crew in spite of the fact that the rough grade was kept very close to the proper contour and elevation. This superintendent believed that it is better to have a crew a little larger than is necessary for average conditions, so that when the peak is reached or something goes wrong there is plenty of man power to carry on. With merely a minimum crew it means that some other part of the job has to be neglected to make up the deficiency in times of emergency. He feels that it is better to keep the crew on until 2 or 3 in the afternoon and then lay them off instead of hunting for a few extra men when needed. 22.1.62

Do You Reverse Your Trucks on Alternate Trips to the Batcher?

145. We have noted that some contractors make a practice of reversing the one-batch trucks on alternate trips to the weighing batcher, going in frontwards one time and backing in the next. The reason for this is that the stone has a chance to clean out the sand and thus prevent a wet spot in one place on the bottom of the truck where the cement and sand are bound to stick, making it necessary for the dump man at the paver to spade the one-batch truck every trip. 21.4.76

EXTRA YARDAGE

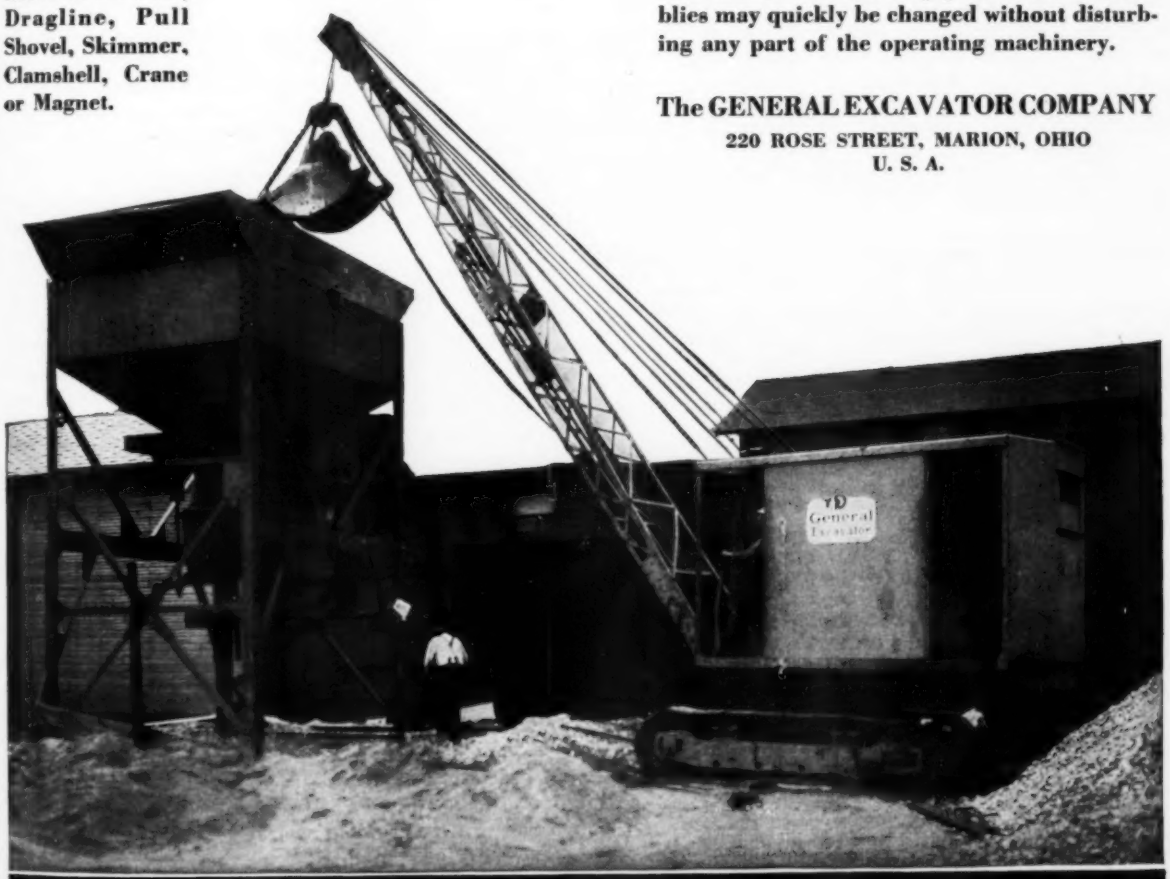
WITHOUT EXTRA COST

The GENERAL EXCAVATOR is rated at a half-yard capacity—but after all the REAL capacity of a machine depends upon its POWER, SPEED and ABILITY to stay with a tough job until it's done. No machine can rightly be called a half-yarder if it is powered with less than a 60-Hp. engine. The GENERAL is powered with a 62-Horsepower engine.

Big profits are assured with The GENERAL because it is the most powerful half-yarder in the field. . . . It has the STRENGTH and real CAPACITY to STAND UP under the HARDEST kind of digging conditions and is convertible in the field with a boom assembly that will best handle any job. Boom assemblies may quickly be changed without disturbing any part of the operating machinery.

Have you any material to handle? If you have, move it with the GENERAL Shovel, Dragline, Pull Shovel, Skimmer, Clamshell, Crane or Magnet.

The GENERAL EXCAVATOR COMPANY
220 ROSE STREET, MARION, OHIO
U. S. A.



General EXCAVATORS

SHOVEL - DRAGLINE - BACKHOE - SKIMMER - CLAMSHELL - CRANE - MAGNET

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Steam Road-Roller Blamed for Fire

A house in New Jersey and its contents burned and the question arose whether the evidence sufficiently proved that the fire was started from sparks thrown from a nearby road-roller. Holding that the evidence was sufficient, the New Jersey Supreme Court said in the case of Durr v. Freehold Construction Co., 153 Atl. 378:

"The proofs showed that the screen over the defendant's road-roller, which was operated by steam, was in a dilapidated condition, there being among other things, a hole in it as large as a man's fist, and that live sparks escaped through this hole and through other defective parts of the screen. The proofs further showed that the wind at the time of the fire was blowing from the direction where this road-roller was operating and towards the house of the plantiff. In our opinion, the facts recited justify the jury's verdict that the defendant company was responsible for the occurrence of the fire."

Implied Warranties of Fitness of Material

"I want 12,000 stock brick for brick veneer purposes," said a buyer. Afterwards he sued the seller, claiming that the brick delivered were not suited to that use. Holding that there was no implied warranty of fitness of the brick for veneer purposes, the Michigan Supreme Court said in an opinion filed February 27, 1931, in the case of Damman v. Mercer-Bryan-Larkins Brick Co., 235 N. W. 194:

"Defendant claims . . . that the term 'stock brick' is a well-known trade name, and, though defendant knew such brick were to be used for brick veneer purposes, there was no implied warranty of fitness for any purpose; the quality being determined by the plaintiff's order for a particular kind and quality of brick, and whether they were fit for the purposes indicated was determined by the buyer. If one orders No. 3 hemlock to build a water tank and No. 3 hemlock is delivered, can he find fault because the lumber is shaky, full of knots, and unsuited for the purpose of building a water tank? Certainly not. We think there was no implied warranty of fitness of stock brick for veneer purposes."

Owner's Failure to Pay

If an owner does not make a progress payment when it is due, the contractor may treat himself as being discharged, abandon the job, and sue for damages for breach of the contract, according to the decision rendered by the Appellate Court of Indiana in the case of Hammond Hotel & Improvement Co. v. Williams, 176 N. E. 154.

But the court does not seem to have intended to depart from the rule generally recognized by the courts that, if the contractor by word or act led the owner to believe that no advantage would be taken of a delay in payment, the contractor will not be permitted to take advantage of it. If the owner has been led to believe that delay in payment would be indulged, the contractor should give reasonable notice of demand for payment before abandoning the contract on the ground of default by the owner in paying an installment due.

Unfair Competition for Business

"You don't mean to tell me that you are going to let the contract to Bill Duhr? Why! he never built anything bigger than a wood-shed. He hasn't got the brains or tools to do your job."

If such knocking should knock Duhr out of a job, would he have a good damage claim against the knocker? According to a recent decision of the Appellate Division of the New York Supreme Court in the case of Union Car Advertising Co. v. Collier, 251 N. Y. Supp. 153, this question must be answered yes.

Plaintiff sued on three different claims for damages based on interference with an award of a contract to plaintiff. The first and second claims were disallowed by the court, because they rested on a supposed agreement with individual members of a corporate board. The court ruled that the board could be bound only by collective action of its members, and not through each one acting individually outside a board meeting.

But the court said that the evidence in the case tended to support plaintiff's third claim, based upon wrongfully preventing the board from making an award to plaintiff. Said the Appellate Division:

"While the principle of law which plaintiff invokes is more or less novel, and is not as yet well defined and formulated by a lengthy line of judicial decisions, it seems clear that the third cause of action as alleged is well founded upon a theory of unfair competition. Just as a business man who occupies a fiduciary relationship with another 'is held to something stricter than the morals of the market place,' . . . so the same business man, through not occupying a fiduciary relationship, may not, within the law, when engaged in ordinary business transactions with another, and dealing at arm's length, descend below the morals of the market place. We are of the opinion that it is unfair competition, not to be countenanced by a court of law, for a business man, wantonly or maliciously, without provocation, to interfere with another person's business by preventing a third party from entering into a contract with such person, which contract, it is reasonably certain, would have been made but for such interference."

Clause Requiring Local Labor Held Valid

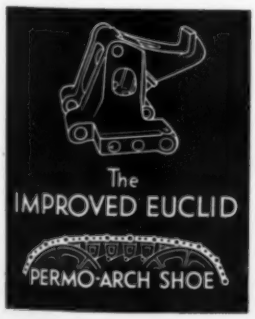
"The subcontractors on the job, as well as the men they employ, must be bona-fide residents of Delaware unless proof is presented to the Board of Public Education in Wilmington that it is impossible to secure the class of work called for from any Delaware concern," read the bidding specifications on a Wilmington school building job.

"That clause violates the provisions of the United States Constitution that guarantees to every citizen of each state all the privileges and immunities of citizens in the other states," complained the plaintiff in a case lately decided by the Delaware Court of Chancery (156 Atl. 286).

But the court said that, under decisions of the highest court of the land, such provisions for the employment of home folks on public works are valid, whether prescribed by statute or voluntarily inserted by the governing board of a municipality.

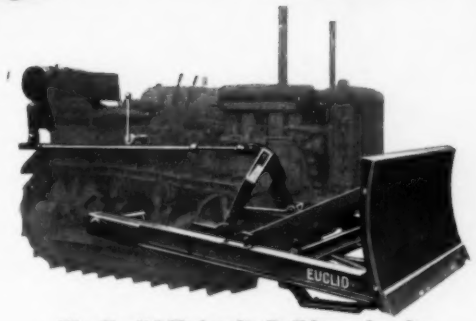
NO TRACTOR "HOGGING" HERE

THAT'S a fact! And the simple reason is that the Euclid Bulldozer leaves the tractor's drawbar free. Free to haul wagons, scrapers, graders, etc., whenever the bulldozer is ahead of the job. That's cutting out profit waste on an idle tractor. And when there's tamping to be done, that free drawbar means your tractor is doing double duty. The bulldozer blade can be easily demounted. Just pull four pins when you're not going to need it for some time—it is mounted just as easily when you're ready to put it back to work. And when it's working, what a job this Euclid bulldozer does! Tremendously strong, but not cumbersome, it was designed and built from practical experience. Yes, sir, it's just the type of equipment you'd build yourself from your own knowledge of what a bulldozer ought to be.



LONGER ARCH LIFE
For EUCLID WAGONS

Euclid's improved Track-Shoe is attached to a drop-forged hook by a hardened steel pin. To get exceptional arch life from Euclid Tracks only the inexpensive hooks need be replaced after severe wear—not the expensive shoes.



The Euclid Hydraulic Bulldozer for the "Caterpillar" Thirty

The Euclid Hydraulic Bulldozer for the "Caterpillar" Fifty

The Euclid Hydraulic Bulldozer for the "Caterpillar" Sixty

THE EUCLID ROAD MACHINERY COMPANY
CLEVELAND OHIO

Who's Who in Construction

A Series of Reports from Active Contractors

BUS. VOLUME—ANNUAL VOLUME OF CONTRACTS
A—Over $5,000,000
B—Between $1,000,000 and $5,000,000
C—Between $500,000 and $1,000,000
D—Between $250,000 and $500,000
E—Under $250,000

Will F. Plummer
President

Will F. Plummer, Inc., Springfield, Mo., Union National Bldg. Organized: 1922. Bus. vol. E. In 1868 E. Plummer first went into the contracting business in Missouri and in 1901 was joined by his son, Will F. Plummer. In 1909 it became the Plummer-Adams Co. and in 1920 Mr. Adams retired, leaving Will F. Plummer as the sole owner. Officers: Will F. Plummer, President, Elizabeth A. Plummer, Secretary. The work of the company consists principally of municipal and railroad contracts usually amounting to $150,000 to $200,000.

Tri-State Engineering Co., Cumberland, Md., 39 Liberty Trust Bldg. Branch office: Waynesburg, Pa. This company was organized as a partnership in 1923 as the Tri-State Engineering Co. In 1927 it was incorporated using the same name. Officers: Claiborne M. James, President and Treasurer; B. C. Coit, Vice President; B. R. Beckner, Vice President. Major contracts: 1929, concrete road for Greene County amounting to $408,464.64; 1930, concrete roads for Greene County, amounting to $416,522.83, $357,536.32, $169,119.86, $96,000, $141,242.26 and a water line for the city of Cumberland, Maryland, $117,000. Member: Associated Pennsylvania Constructors.

Spooner Bridge Construction Corp., Albany, N. Y., 488 Broadway. Organized: 1929. Bus. vol. D. Officers: Joseph A. Spooner, President; George B. Miller, Vice President; A. J. Sobeck, Secretary & Treasurer. Major contracts: bridges at Stockbridge, Fairfax, West Burke, Ludlow, Cambridge, Vt., and at Brinckerhoff, N. Y.; seven bridges on the Stratford-Pine Lake Highway, Rensselaer Falls, Gouveneur, Edwards, South Edwards, Painted Post, Greene, Wilson, Deposit; three bridges on the Piseco-Lake Pleasant Highway, bridges at Fleischmanns, North Hudson, Preston Hollow, Indian Fields and a 540-foot three-span bridge at North Blenheim, N. Y. Member: Chamber of Commerce.

R. C. Ballinger Co., Philadelphia, Pa., 925 Walnut St. Organized: 1879. Bus. vol. C. This company was formed as R. C. Ballinger & Co. in 1879. In 1928 it was changed to the R. C. Ballinger Co. upon the retirement of R. C. Ballinger. Officers: Ernest R. Yarnell, John A. Stratton, Paul B. Cotter. Major contracts: 1928, Goodheart Hall, Bryn Mawr College, $417,000, Unitarian Church, Philadelphia, Pa., $334,000, Dormitory building and school building, Lakewood, N. J., $323,000, work on estate in Chestnut Hill, Phila., $50,000; 1929, Westtown Meeting House, Westtown, Pa., $44,000, alteration for A. E. Newbold, $66,000, residence, $160,000, First Church of Christ, Scientist, Swarthmore, $48,000, residence in Philadelphia, $137,000, church in Upper Derby, Pa., $155,000. Member: Master Builders & Carpenters Association of Philadelphia.

E. P. Muntz, Inc., Buffalo, New York. Lehigh Valley Terminal. Branch Office: Toronto, Ontario. Organized in 1926. Bus. vol. C. This company was first organized in 1923 as an individual concern and in 1926 was incorporated under the name of E. P. Muntz, Inc. Officers: E. P. Muntz, President; E. G. Strothy, Vice President; M. G. Eighmy, Vice President. Major contracts: New York Central bridge replacement, $80,000; Ontario Government, Paris high level bridge, $200,000; Canadian Pacific Railway, Lansdowne subway, Toronto, $100,000; Delaware Lackawanna & Western Railroad grade crossing eliminations, $125,000. Member: A. G. C.

L. E. Martel, Manchester, N. H., 102 Bridge Street. Mr. Martel started doing business in 1912, specializing in residences and tenement blocks. He is at present interested in public building. Major contracts: 1930, building for the Firestone Tire & Rubber Co., at Akron, Ohio and filling station for the Shell Co. at Akron, each valued at over $40,000 and also a new bridge and reinforcing the concrete bridge in New Hampton, N. H. and in Farmington, N. H. Member: Chamber of Commerce.

Kreis Contracting Co., Inc., Knoxville, Tenn., 608-10 Burwell Bldg. Branch offices: Council Grove, Kansas, St. Louis, Mo. Organized: 1931. Bus. vol. C. The Kreis Contracting Co. was organized in January, 1931, a subsidiary company to J. A. Kreis & Sons, Inc., which organization was formed in 1926 and from that date has successfully completed contracts aggregating more than $8,000,000. Officers: R. H. Kreis, President, J. E. Kreis, 1st Vice President and General Manager; Peter Kreis, 2nd Vice President; J. A. Kreis, Director; A. L. Byrd, Secretary and Treasurer; Frank Maloney, C. N. McCollum and M. W. Duncan, Engineers. Major contracts: 1929, Missouri-Pacific Railroad, grade, structures and tunnels in Kansas, $4,250,000; 1929 and 1930, Missouri & Kansas & Frisco, $1,100,000; Southern Railway Co. in North Carolina and Kentucky, $300,000. Member: A.G.C.

Standing, J. E. Kreis; Seated, Left to Right: Peter Kreis, J. A. Kreis and R. H. Kreis

BLAW-KNOX BUCKETS ARE GUARANTEED

BLAW-KNOX Dreadnaught Buckets are guaranteed to outdig any other make of bucket of equal weight and size. Ask your nearest Blaw-Knox distributor about this.

Blaw-Knox Digging Buckets have 25 years of engineering experience behind them: they have been constantly redesigned and mechanically improved. Each bucket, part by part, is made for the duty it is called upon to perform — from ball bearings to hardened guide rollers, it represents extremes of toughness and anti-friction.

This means PERFORMANCE which is guaranteed in every Blaw-Knox Dreadnaught Bucket you buy.

Send for new Dreadnaught Bucket Catalog, Form 1339, just off the press.

BLAW-KNOX COMPANY

2067 Farmers Bank Building **Pittsburgh, Pa.**

New York Chicago Cleveland Buffalo Birmingham Philadelphia Baltimore

Pacific Coast Division

Blaw-Knox & Western Pipe Corp., San Francisco

Export Division:—Blaw-Knox International Corporation, Canadian Pacific Building, New York London England, New Oxford House, Hart Street, Holborn, W. C. I.—Paris,-8, France, 4, Place des Saussaies— Milano, Italy, 6, via S Agnese, 6—Dusseldorf, Germany, 17 Bismarckstrasse

BLAW-KNOX

Road Forms—Ord Road Finishers—Batcherplants—Weighing Batchers—Volume Batchers—The Cementank—Bulk Cement Plants—Wagon Graders—Steel Forms for Streets and Sidewalks—Truck Turntables—Nu-Method Finish Grader—The Inundation System—Clamshell and Dragline Buckets—Ready Mixed Concrete Plants—Truck Bodies

During March we hope you will remember to mention CONTRACTORS AND ENGINEERS MONTHLY.

Construction Industry News

Clyde Iron Works Sales Co., Duluth, Minn., has acquired the business of the Dayton Whirley Co., and will manufacture its complete line of boom draglines for the dirt moving industry, machines for clamshell operation for sand, gravel and material handling plants, hook work machines for pile driving, concrete placing and form work for the general contracting industry and all of the full circle type powered with steam engine, gas or electric motor. In the future the machines, which will be manufactured at Duluth, will be known as the Clyde Wiley-Whirley.

O. K. Clutch & Machinery Co., Columbia, Pa., has announced that its manager, H. Druschel, has been granted a patent on an after cooler for compressors. This will reduce the heat of the air from 250 degrees to 115 degrees Fahrenheit or over 50 per cent.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has announced the appointment of L. W. Grothaus as General Representative succeeding C. E. Searle. Mr. Grothaus became affiliated with Allis-Chalmers in 1904 and has occupied various offices with that company.

White Manufacturing Co., Elkhart, Ind., has announced that the business of the Chausse Oil Burner Co., also of Elkhart, will in the future be conducted by them. Development of a complete new line of bituminous road building machinery by White Manufacturing Co. engineers has influenced the decision to market this equipment hereafter as Chausse-White products. This line consists of bituminous paving mixers for hot and cold materials, rotating aggregate dryers, and complete pre-mixing plants in addition to the Chausse street repair machines, tar kettles and kerosene torches. Since 1924 the White Manufacturing Co. has produced all Chausse equipment.

Caterpillar Tractor Co., Peoria, Ill., has announced a Model Sixty-Five, a step-up in size from the familiar Sixty. At the same time, a price reduction of about 10 per cent in the price of the recently announced Thirty-Five has been made.

Beaumont Mfg. Co., 319 Arch St., Philadelphia, Pa., has recently reorganized its Bin Division and formed the **Beaumont Bin Co.**, which will devote itself entirely to specializing in the design and manufacture of all types of bins, including storage and aggregate bins, central mixing plants, bulk cement handling, automatic weigh batchers and all types of bin gates. There are branch offices in New York, Chicago, Cleveland and Detroit.

Keystone Driller Co., Beaver Falls, Pa., has announced that at a special meeting of the Board of Directors recently the following officers were elected: President, L. M. Johnston of Pittsburgh, formerly Vice-President of A. M. Byers Co.; Vice President, E. C. Rebeske, President of the First National Bank of Beaver Falls, formerly Treasurer of the Union Drawn Steel Co.; Secretary, R. R. Downie, and Treasurer, C. T. Smith. The last two officers were re-elected.

Harnischfeger Corp., Milwaukee, Wis., has announced that it has taken over the Hansen arc welder formerly made and marketed by the Northwestern Manufacturing Co. Harnischfeger will produce the welder in the same range of sizes and with the same structural features as previously, namely the single current control, the self-exciter feature, and the internal stabilizer.

International-Stacey Corp., Columbus, Ohio, announces that the Fort Worth offices of its subsidiary companies, International-Derrick & Equipment Co., Roots-Connersville-Wilbraham, Stacey Brothers Gas Construction Co. and Stacey Manufacturing Co. have been moved to Room 307 Southland Life Insurance Bldg., Dallas, Texas.

Blaw-Knox Co., Pittsburgh, Pa., and **Western Pipe & Steel Co.** of San Francisco and Los Angeles have closed an agreement whereby Western Pipe & Steel Co. will manufacture Blaw-Knox products on the Pacific Coast and will sell through the organization of a new company to be known as Blaw-Knox & Western Pipe Corp. This new concern will be equally owned by the two companies.

Specialization or Diversification—The Contractor's Problem

IN a recent discussion of the subject of construction management, appearing in the *Proceedings* of American Society of Civil Engineers, A. P. Greensfelder, President, Fruin-Colnon Construction Co., St. Louis, Mo., contributes the following paragraph to this all important question.

"There is a fair difference of opinion, particularly in this time of depression, as to how much a construction organization should specialize or diversify its bidding. Specialization is seemingly the order of the day. An organization with specialized machinery and crew, theoretically, should have the advantage over one that does not. On the other hand, unless there is a great deal of that particular class of construction work continuously at hand in the community, it means that the organization must enlarge its territory and follow such class of work wherever it may be found. Diversification, on the contrary, permits a smaller radius of travel and guards against having all one's organization and capital tied up in one particular type of work."

Hot and Cold Mix as Needed

(*Continued from page 32*)

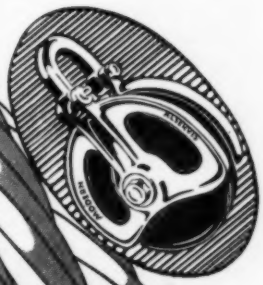
fuel oil storage tank is also provided. The oil is pumped to an elevated tank of 200-gallon capacity located on the floor of the mixing plant and is fed by gravity to the oil burners in the drier. Two steam boilers were installed, one being held as a standby for emergency use. All condensate is returned to the steam boiler by a regular trap and hot well system.

The stone and sand aggregates are loaded by crane into a two-compartment hopper of large capacity and fed through a chute and adjustable gate into the cold material elevator boot.

The plant is very well arranged with all of the units conveniently located as will be noted in the illustration. Automatic remote button control is used for all of the motors and the operation of the entire plant is controlled by one man at the mixer floor. Safety buttons are also provided at various points so that individual motors may be stopped immediately in case of accidents. A close and accurate temperature control is automatically obtained in the drier. The entire operation of the plant and yard is performed by three men including the foreman. The plant equipment was furnished by the Asphalt Equipment Co. of Scottdale, Pa.

WILLIAMSPORT WIRE ROPE

Send for literature on our new line of MODERN BLOCKS built as blocks should have been built long ago.



Anytime-Anywhere stands the most gruelling tests

Send for literature today on our special constructions of wire rope for longer service and greater strength.

These constructions were recently developed for specific purposes and you may have an operation on which these ropes will give noticeably superior service—with much greater economy.

WILLIAMSPORT WIRE ROPE COMPANY

General Sales Offices
PEOPLES GAS BLDG., CHICAGO
Main Office and Works
WILLIAMSPORT, PA.

WILLIAMSPORT PLOW STEEL WIRE ROPE

The Equipment Distributor

San Jose Hardware Co., San Jose, Calif., has recently been appointed distributor for Sullivan air compressors, rock drills, concrete breakers, clay spaders, drill sharpeners and portable hoists, together with parts and supplies which will be kept in stock, made by the Sullivan Machinery Co., Chicago, Ill.

E. Gwynn Robinson, 137 E. 66th St., New York City, is now distributor for the LeRoi-Rix line of portable and stationary air compressors. Mr. Robinson also has a warehouse and service station at 327 Canal Place, New York City.

The Brandeis Machinery & Supply Co., Louisville, Ky., through its President, J. A. Paradis, was host at a noon luncheon tended to 200 members of the Kentucky Association of Highway Contractors and their friends on February 3.

Caterpillar Distributors throughout the United States competed in a sales contest from May 1 to September 15, 1931. Over 600 dealers' salesmen participated. The distributors whose salesmen won the three main prizes in each of the three zones were recently announced as: Zone 1, Easton Tractor & Equipment Co., Alexandria, La., both first and second prizes and General Tractor and Equipment Co., Minneapolis, Minn.; Zone 2, Shepherd Tractor & Equipment Co., Los Angeles, Calif., Robinson Tractor Co., Oakland, Calif., Arizona Tractor & Equipment Co., Phoenix, Ariz.; Zone 3, Evans Tractor & Equipment Co., Rapid City, S. D., Robert T. Twedt Co., Cheyenne, Wyo., and Connelly Machinery Co., Billings, Mont. To each of the distributors whose salesmen won a prize an award of merit in the form of a bronze plaque was presented in acknowledgment of their cooperation.

Queen City Supply Co., Cincinnati, Ohio, has an enthusiastic large game hunter in R. G. Folz, Manager of the Equipment Department. The accompanying picture shows Mr. Folz (right) returning with his bag. He was accompanied on the trip by R. M. Edgar and S. T. Isaac, President, the Columbus Conveyor Co., Columbus, Ohio.

R. G. Folz, Mgr. of Equipment Dept., Queen City Supply Co., (Right) and William King, West Hickory, Pa., Returning to Camp with a Deer

Boehck Equipment Co., Milwaukee, Wis., with offices and warehouse at 2404 W. Clybourn Street, has recently been appointed Wisconsin distributor for the Barber-Greene Co., of Aurora, Ill.

F. H. Burlew Co., 221-225 West Huron St., Chicago, Ill., has announced the purchase of the business of the R. H. Hyland Co. This firm will handle all lines of equipment and supplies formerly handled by Hyland.

Browning-Ferris Machinery Co., Dallas, Texas has announced the removal of its Houston office and warehouse to its new building at 2619 Texas Avenue.

H. W. Moore Equipment Co., Denver, Colo., on January 21, served luncheon to about 400 commissioners during the meeting of the Colorado County Commissioners Association in Denver. The entertainment was furnished by the staff of radio station KOA of Denver which was broadcast by remote control.

Roy C. Whayne Supply Co., Eighth and Main Streets, Louisville, Ky., has announced the appointment of Ezra Price of Lexington, Ky., as its representative in eastern Kentucky. He was formerly engaged in highway contracting and for several years had represented the Signal Mountain Portland Cement Co. in Kentucky.

Wilson Machinery & Supply Co., Inc., Lexington, Ky., has been appointed exclusive distributor for Novo engines, hoists and lighting units by the Novo Engine Co., Lansing, Mich. The officers of this distributing organization, Reed Wilson, President; Tilford Wilson, Vice President; C. O. Sageser, Secretary, are assisted by seven traveling salesmen.

Ensminger & Co., Wilkes-Barre, Pa., has announced the removal of its office and warehouse from 181 S. Washington St., to 75-77 Hazle St.

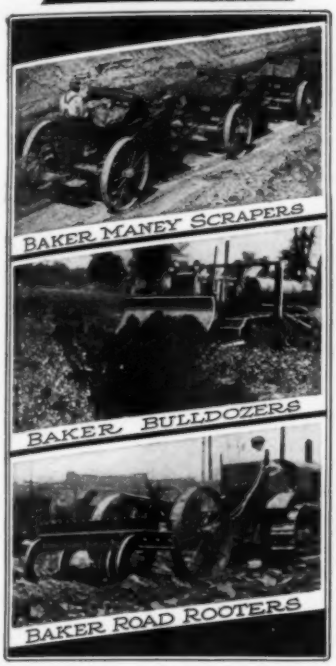
Superior Construction Equipment Co., 1850 South Kostner Ave., Chicago, Ill., has announced the acquisition of three new lines, namely, O. K. Clutch & Machinery Co.'s line of hoists, the Portable Machinery Co. Division of A. V. Farquhar Co.'s line of portable and sectional conveyors and the National Highway Marker Co.'s products.

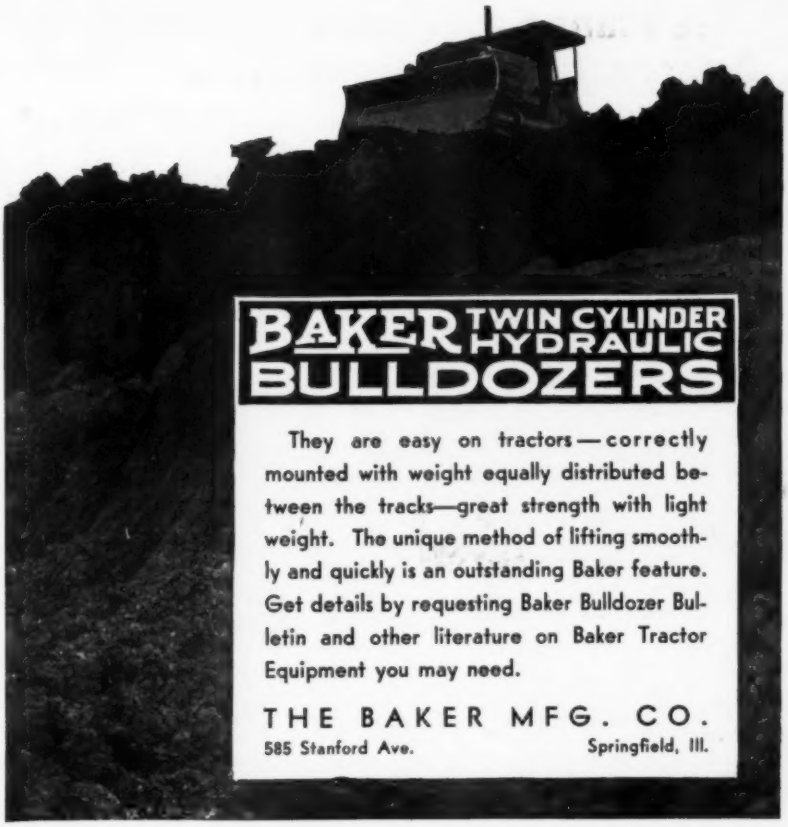
Distributors' Bulletin Board

The distributors of construction equipment listed below have made changes this month in their cards appearing in the Distributors' Directory on pages 79 to 103 of this issue of CONTRACTORS AND ENGINEERS MONTHLY:

O. B. Avery Co., Saint Louis, Mo.
Bluefield Supply Co., Bluefield, West Va.
Herman M. Brown Co., Des Moines, Iowa
Bublitz Machinery Co., Kansas City, Mo.
F. H. Burlew Co., Chicago, Ill.
Carolina Contractors Equipment & Supply Co., Columbia, S. C.
Howard Cooper Corp., Portland, Ore.
DeHuff & Hopkins, Philadelphia, Pa.
Drott Tractor Co., Inc., Milwaukee, Wis.
E. K. S. Equipment Co., Grand Rapids, Mich.
Hunter Machinery Co., Milwaukee, Wis.
Interstate Machinery and Supply Co., Omaha, Neb.
C. H. Loomis & Co., Newark, N. J.
G. F. Lowe Co., Chicago, Ill.
H. W. Moore Equipment Co., Denver, Colo.
Northfield Iron Co., Northfield, Minn.
S. & L. Equipment Co., Fort Wayne, Ind.
The W. T. Walsh Equipment Co., Cleveland, O.
Wm. H. Ziegler Co., Inc., Minneapolis, Minn.

BAKER
TRACTOR EQUIPMENT
EARTH MOVING-ROAD MAINTENANCE-SNOW REMOVAL

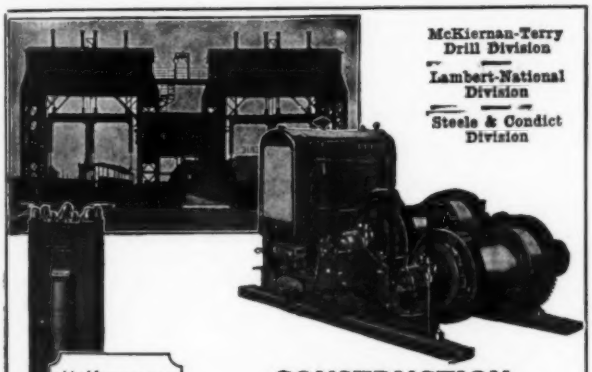




BAKER TWIN CYLINDER HYDRAULIC BULLDOZERS

They are easy on tractors — correctly mounted with weight equally distributed between the tracks—great strength with light weight. The unique method of lifting smoothly and quickly is an outstanding Baker feature. Get details by requesting Baker Bulldozer Bulletin and other literature on Baker Tractor Equipment you may need.

THE BAKER MFG. CO.
585 Stanford Ave. Springfield, Ill.



McKiernan-Terry Drill Division
Lambert-National Division
Steele & Condict Division

McKIERNAN -TERRY PILE HAMMERS

STEELE & CONDICT DIVISION OF McKIERNAN-TERRY CORP.

CONSTRUCTION EQUIPMENT
Pile Hammers and Accessories
For driving and pulling piles
For subaqueous driving

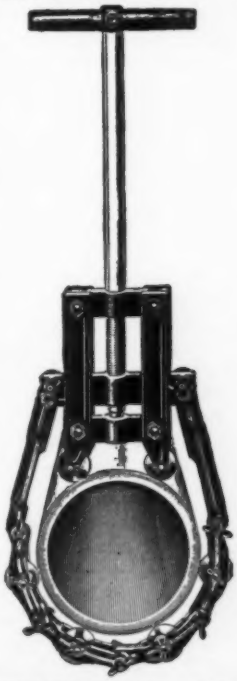
Lambert-National Hoists
of all types
Steel and Wood Derricks, Whirlers, Cableways and Car Movers

Steele & Condict
Bridge-operating Machinery

Write for descriptive catalogs
McKIERNAN-TERRY CORPORATION
19 Park Row, New York
Distributors in Principal Cities

LAMBERT-NATIONAL HOISTS : STEELE & CONDICT MACHINERY
McKIERNAN-TERRY DOUBLE ACTING PILE HAMMERS

ONE CUT SAVES THE PRICE



YOU, too, may save the cost of this pipe cutter on one job, just as many other companies have done.

The ELLIS PIPE CUTTER

with its six keen rotary cutting blades eats its way right through any pipe in double - quick time. Use No. 01 for all kinds of pipe 4 to 8 inches in diameter, or No. 1 for pipe 4 to 12 inches in diameter.

Write for circular

ELLIS & FORD MFG. CO.
32 Piquette Ave. DETROIT, MICH.

A Plant for Coating Aggregate with Bitumen

The Saturmix Plant for Coating Aggregate with Asphalt

THE increasing demand for a bituminous paving mixer to be used for the surfacing and construction of secondary roads and for resurfacing old roads of other types led to the development of Saturmix equipment by the Saturmix Corp., Wooster, Ohio. The Saturmix machine consists of a framework supporting an emulsion tank, a storage bin, where a perforated basket is so arranged as to be capable of receiving aggregate while immersed in the emulsion tank, and then being so rotated as to slowly discharge the aggregate from the basket into the storage bin. The frame is so built as to readily permit transportation from place to place and the overall width does not exceed that allowable for vehicles on highways.

The emulsion tank is large enough to accommodate the emulsion basket which forms a tight seal around the top when in position to receive the aggregate to be coated. A sludge trough is arranged at the bottom of the tank with a suitable opening to permit the removal of any material which does pass through the basket or which gets into the tank in any other manner. Steam coils are arranged in the tank for use in the event that it is desirable to use a cut-back asphalt or tar as a binder instead of emulsion, or if operation is during freezing weather.

The storage bin holds approximately 6 tons of material and is arranged with a chute gate at its lower end, operated by means of a lever with suitable counterweight. This bin is provided with a drainage trough underneath the hinge point of the gate to receive the drainage of any excess binding material which may be brought over with the coated aggregate.

The immersion basket is constructed of sheet steel with perforated double partitions permitting the binding material to have ready access to the aggregate to be coated. The immersion basket is rotated by a bull-wheel mounted on one end of the shaft which supports the basket. The bull-wheel is driven by ropes actuated by a friction hoist mechanism. The pump required for placing the bituminous binder in the emulsion tank is of the open impeller centrifugal type, with large openings to allow for the passage of any foreign substance that may get into the piping system. The unit is powered with a 4-cylinder gasoline engine, arranged with roller chain drive to the pump and to the hoisting mechanism.

An Aluminum Boom for Draglines

A LIGHT-WEIGHT aluminum boom for any size of dragline is now being manufactured by the Bucyrus-Erie Co., South Milwaukee, Wis. The feature of this boom is its weight which is only two-thirds that of a steel boom. As a steel boom has one-half as much more weight and more than 50 per cent additional inertia, it is possible to secure, with the aluminum boom, a longer reach with standard bucket sizes or an increase in bucket size with standard boom lengths. A number of these booms are already installed, same having been in service for over a year.

A New Six-Cylinder Diesel Engine

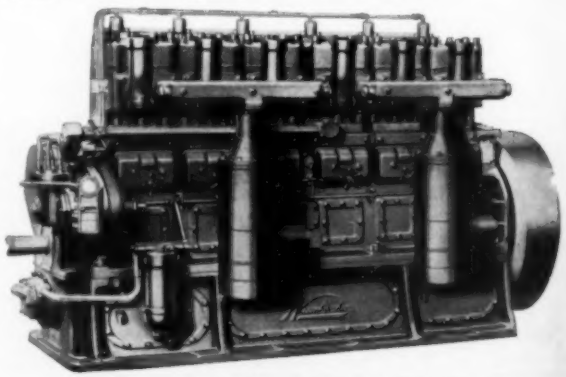
A 7¾ x 8½-inch full diesel engine of 180 to 200 horsepower and which has all of the essentials of the four-cylinder diesel engine, has been announced by the Waukesha Motor Co., Waukesha, Wis. The new Waukesha engine is a four-cycle, solid injection unit with a Bosch injection pump and fuel system, a special compressed air starting system, and the Waukesha ell head, high turbulence combustion chamber. Since engines of this type must be started by mechanical means, the gasoline auxiliary starting system that was used on the four-cylinder engine a year ago is of no practical advantage and is omitted. The present six-cylinder engine is complete with fuel, air and lubrication filters, and all necessary attachments for placing it in immediate operation.

This diesel Great Six Model 6-DLK is a heavy duty unit for both stationary and semi-portable work, and for such portable uses as are common in construction work. It is adapted to small municipal lighting and pumping plants and to dredge and pump drives. The design is simple. It is of the airless injection, compression ignition type, with no pre-combustion chambers or other modifications of the simple diesel principle. The manufacturer has made a definite endeavor to employ the fewest possible number of parts, all fully enclosed, but thoroughly accessible through the large inspection doors which permit both inspection and adjustment of all the major moving parts within the engine.

In addition to contributing the simplicity of direct-acting valve mechanism, the turbulence created by the ell head combustion chamber of the Waukesha diesel engine promotes the intimate mixture of the fuel and air and thus assures efficient combustion at all loads and speeds within its capacity. This results in greater fuel economy, greater smoothness and greater freedom from carbon. It also makes it possible to operate at various speeds and loads without any change of the injection timing.

A Robert Bosch fuel pump with the necessary special features to suit the Waukesha engine has been developed to make possible the many economies afforded through specialized quantity production. Used in combination with a special form of Bosch injection valve, it is possible to burn any commercial diesel engine oil ranging in gravity between 18 and 40 degrees Baume, having a viscosity of 40-75 seconds Saybolt at 100 degrees Fahrenheit.

A compressed air starter employing special pneumatic relay valves to admit air to each cylinder from the main air header insures a dependable start even with moderate air pressures. Clutches, stub shafts, pulley shafts, and accessories can be applied for practically any commercial drive.



The Waukesha 200-horsepower Diesel Engine

BUFFALO-SPRINGFIELD

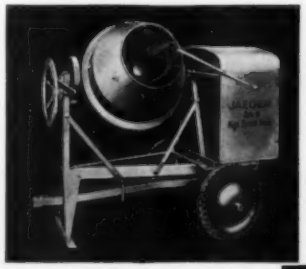
Travel the Lincoln or the famous "40." Take the byways as well as the highways, or the streets of our cities, large and small. The Buffalo-Springfield meets your gaze. You find them everywhere — some venerable with age and years of service —others new and of latest models.

All practical sizes, steam and motor types. Attachments, including scarifier, optional.

The Buffalo-Springfield Roller Co.

Springfield, Ohio

JAEGER *offers* MORE *for* YOUR MONEY---



---*in* "Dual-Mix" Tilters *at* $169 *up:*

half-bag trailers and 3½S, 7S, 10S power loaders with double the mixing action of any other tilter made.

---*in* Non-Tilters *that Outperform all Others:* from SPEED KING 7S trailer to 56S, a size and type to fit your job and handle it to best advantage.

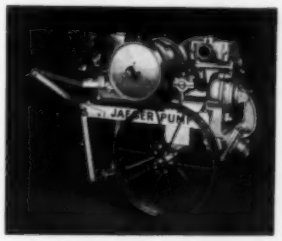
---*and in Improved* PUMPS *at* LOWER PRICES!

From the 2", 10,000 gallon SPEED BOY Self-Priming Centrifugal ($181, f. o. b. Columbus), Jaeger Pumps offer improved performance at remarkably low prices—an opportunity to save real money on your drainage work this year.

Self-Priming Centrifugals, Convertible Diaphragms (at no extra cost), Plunger Lift and Force, Standard Centrifugals—all sizes.

Attractive prices on Hoists, Placing Equipment

2", 10,000 Gallon Speed Boy



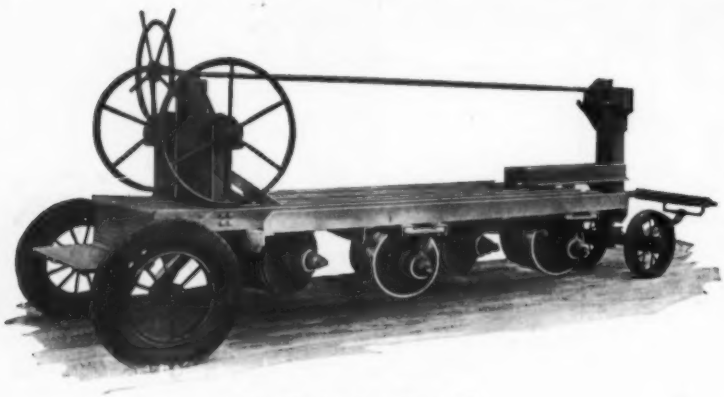
Get this Catalog before Buying

THE JAEGER MACHINE COMPANY,
701 Dublin Ave., Columbus, Ohio

Send latest catalogs and prices on Jaeger ☐ Mixers, ☐ Pumps, ☐ Hoists, ☐ Jaeger-Lakewood Placing Equipment,

Name_____

Address_____



The Killefer 4-A Road Disc

Multiple Discs Cut Bumps from Oiled or Asphalt-Treated Streets

THE removal of bumps in old oiled roads or asphalt-surfaced streets and roads is a matter of only a few minutes with the Killefer 4-A road disc machine made by the Killefer Mfg. Corp., Ltd., 5525 Downey Road, Los Angeles, Calif. These machines are built with four sets of cutting discs, the two forward sets being worked shallow and the rear discs deeper. The best work is done by this machine in warm weather when the pavement is soft. They require comparatively small power such as a 20-horsepower tractor or a truck. Traffic need not be taken off the street or highway while the work is in progress as there are no flying pavement chips. The cutting edges press downward into the high spots instead of chiseling or gouging them upward with the attendant danger to operators and passing traffic. The hidden manholes and car tracks can be crossed with safety, as the discs roll over them, and there are no pointed tools to catch on hidden obstructions.

The road bed material is not disturbed by the discs as there is no lifting action. The discs cut without chatter or clogging as the material does not gather in front of them. The disc blades are electric-treated steel 20 inches in diameter and 5/16-inch thick. Killefer road discs are now made in two models. One is equipped with rubber tires and rear controls and it can also be obtained with steel tires instead of rubber. The other model is equipped with steel tires and top controls. These machines work a strip of pavement 45 inches wide. The disc blades are arranged in four gangs, two in front and two in the rear. The rear discs make their cuts half way between the cuts of the gangs ahead. In this way the small markings left on the pavement are only 1 inch apart. A grader pulled behind the road disc pushes the cuttings to the side leaving a smooth roadway. The cut-off material is used for patching or bladed over for shoulder surfacing.

Two New Truck Models

A 1½-ton 6-cylinder truck chassis and a high-speed 5 to 6-ton model have recently been announced by the Federal Motor Truck Co., Detroit, Mich. The new 1½-ton model has standard Federal features and is powered with a 6-cylinder L-head type engine, 3⅜-inch bore and 4-inch stroke, developing 72 horsepower. Other features of this model include four-speed transmission, four-wheel hydraulic brakes, full floating rear axle, 10-inch heavy clutch and a heavy pressed steel frame 6 inches deep, ¼-inch thick with 2¾-inch flanges. Four wheelbase lengths are provided, 130, 142, 154 and 166 inches. Standard tires are 6.00/20 6-ply balloon front and 32 x 6 single high-pressure rear, mounted on ventilated disc type demountable wheels.

The new 5 to 6-ton model, designed for rapid transportation and other heavy-duty service, has heavier construction throughout, a larger motor, larger tires and many new features. The extra heavy construction includes a 14-inch clutch, two-range 7-speed transmission, full floating double reduction type rear axle with new high traction differential, a massive steel frame, high grade alloy steel springs and auxiliary springs, a 7½-inch channel steel front bumper and heavy 10-stud ventilated disc-type demountable wheels, single front and double rear, equipped with 9.75/20 balloon tires. Power is supplied by a 4⅜-inch bore x 4¾-inch stroke overhead valve 6-cylinder 7-bearing engine with dual ignition. This model is built with Westinghouse four-wheel air brakes or four-wheel hydraulic brakes with vacuum booster. The available wheelbases are 153, 165, 177, 185, 195, 213, 231, and 249 inches.

Other features of these new 5 to 6-ton models are the Federal Reservoil oiling for spring pins and cross shafts, roller bearing steering gear, improved mounting of battery and tool box in back of the running board shields, a new and distinctive-type chromium plated radiator, large chromium head lamps and twin electric horns.

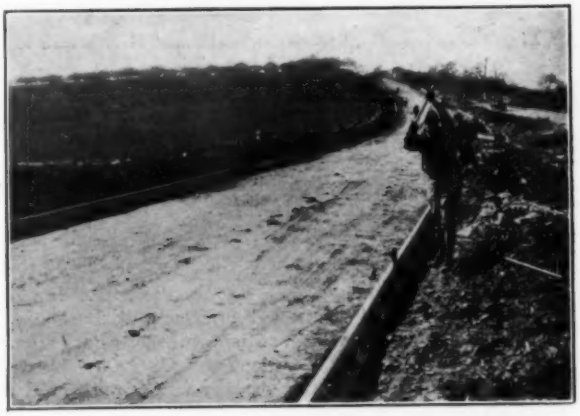
A Portable Conveyor with 14-inch Belt

A LIGHT one-man all-purpose belt conveyor for unloading or reloading sand, gravel, cinders and crushed stone has been announced by the Jeffrey Manufacturing Co., Columbus, Ohio. All that is required for using this machine is a shallow pit under the railroad track. This machine is readily moved about a contractor's yard and can also handle material from ground storage. It is built with an all-steel frame and a flared loading hopper which protects the edges of the belt by centering the load. Belt strip lining is used on the sides of the hopper. Anti-friction bearings are used throughout the loader with the Alemite system of lubrication. The conveyor is raised or lowered by a rigid low overhead mast operated by a hand windlass. The swivelling wheels are roller bearing and facilitate movement of the machine. The conveyor is built in two lengths, 22 feet and 28 feet, and is operated either by electric motor or a gasoline engine.

The Jeffrey Type 215-A Portable Belt Conveyor with All-Steel Frame

HELTZEL—STEEL ROAD FORMS

SUPERIORITY
has been
PROVEN BY
actual
experience of
CONTRACTORS
who use them



Heltzel Road Forms under actual working conditions

THE HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO

STANDARD

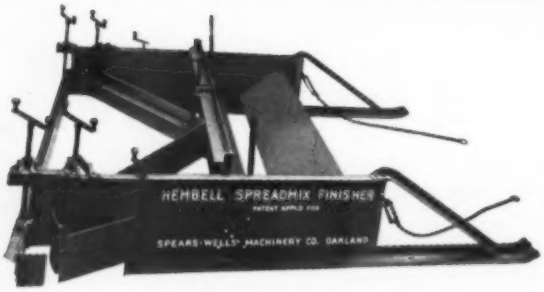
(Socony Brand)

Asphalt Products

Standard Cut-Back Asphalt for surface treatment and mixed-in-place construction.
Standard Asphalt Binder A for surface treatment.
Standard Asphalt Binders B and C for penetration work (Asphalt Macadam).
Standard Paving Asphalt 51-60 and 61-70 Penetration for the mixing method. (Asphaltic Concrete.)
Standard Cold Patch Asphalt for all types of patching.
Standard Refined Asphalt for sheet Asphalt paving.
Standard Asphalt Joint Fillers.
Standard Waterproofing Asphalt.
Specifications and all other particulars furnished on request.

SOCONY ASPHALTS AND ROAD OILS

STANDARD OIL COMPANY OF NEW YORK, INC., 26 BROADWAY



A New Machine for Resurfacing

A Spreader for Bituminous Material

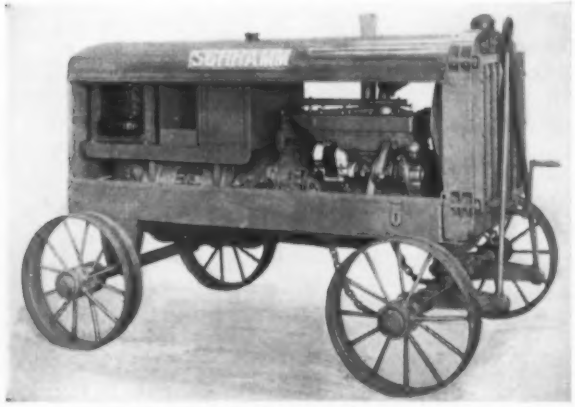
A NEW machine, known as the Hembell Spreadmix Finisher, was recently developed by Hemstreet & Bell, on their bituminous treated surfacing work for the California Division of Highways, and is now being manufactured by the Spears-Wells Machinery Co., Oakland, Calif. This unit spreads the surface of the road, the only further work which is necessary being finishing and compaction rolling.

The Spreadmix consists of a skid-mounted hopper to the rear of which is fastened an adjustable V-type spreading and straight-across final leveling blade, together with clean-up wings and edge locating blades. The standard-size machine works on 20 or 22-foot roads, either one or two strip construction. The machine spreads, mixes and levels any type of base or surfacing material in depths from 1 to 8 inches to a condition ready for finishing machine or rolling.

A New Portable Welder

A COMPLETE line of portable engine-driven welders in four sizes, designed to meet welding requirements in the construction industry, has recently been announced by Schramm, Inc., West Chester, Penna. These four sizes, 200, 300, 400 and 600-ampere units, contain the latest improvements in welders of this type and are capable of welding over a wide range of current. The generator unit is designed for rapid voltage recovery. A transforming reactor automatically steadies and regulates the arc. Single-operator welding machines are available, consisting of a variable voltage type of welding generator direct-connected to a gasoline engine, as well as duplex units with two welding generators.

Any of the mountings for portable use can be supplied, such as spring trailer, highway trailer, two-wheel pneumatic tired or rubber tired wheels, steel wheels, skids or mountings for all standard makes of motor trucks.



A New Portable Welding Unit

Vibrating Hammers for Concrete Work

TWO new models of portable electric hammers for vibrating concrete have recently been announced by the Syntron Co., Pittsburgh, Penna. These hammers are simple in design, consisting of two electro magnets wound around a hollow barrel, reciprocating a free moving piston back and forth which strikes the vibrating tool directly on the shank, imparting 3,600 vibrations per minute through the vibrating tool to either the form or the reinforcing bar.

The smaller and lighter of these models, No. 11-60, weighs but 11 pounds, strikes 3,600 blows per minute and is designed primarily for vibrating forms made of light planking, using a tool with a mushroom shaped head for contact with the form work. The operator holds this tool against the form where the concrete is being poured and moves it around to follow the flow of the concrete. It can also be used for vibrating the lighter reinforcing bars. The more powerful hammer, known as No. 16-60, weighs 16 pounds and is designed for vibrating heavy reinforcing bars and form work made out of heavy planking. It works on the same principle as the smaller model. Both of these hammers operate from the ordinary 110-volt lighting current and can be used continuously all day by one man without excessive fatigue.

Syntron Electric Hammers Vibrating Concrete Slab

A New 6-Cylinder Gasoline Engine

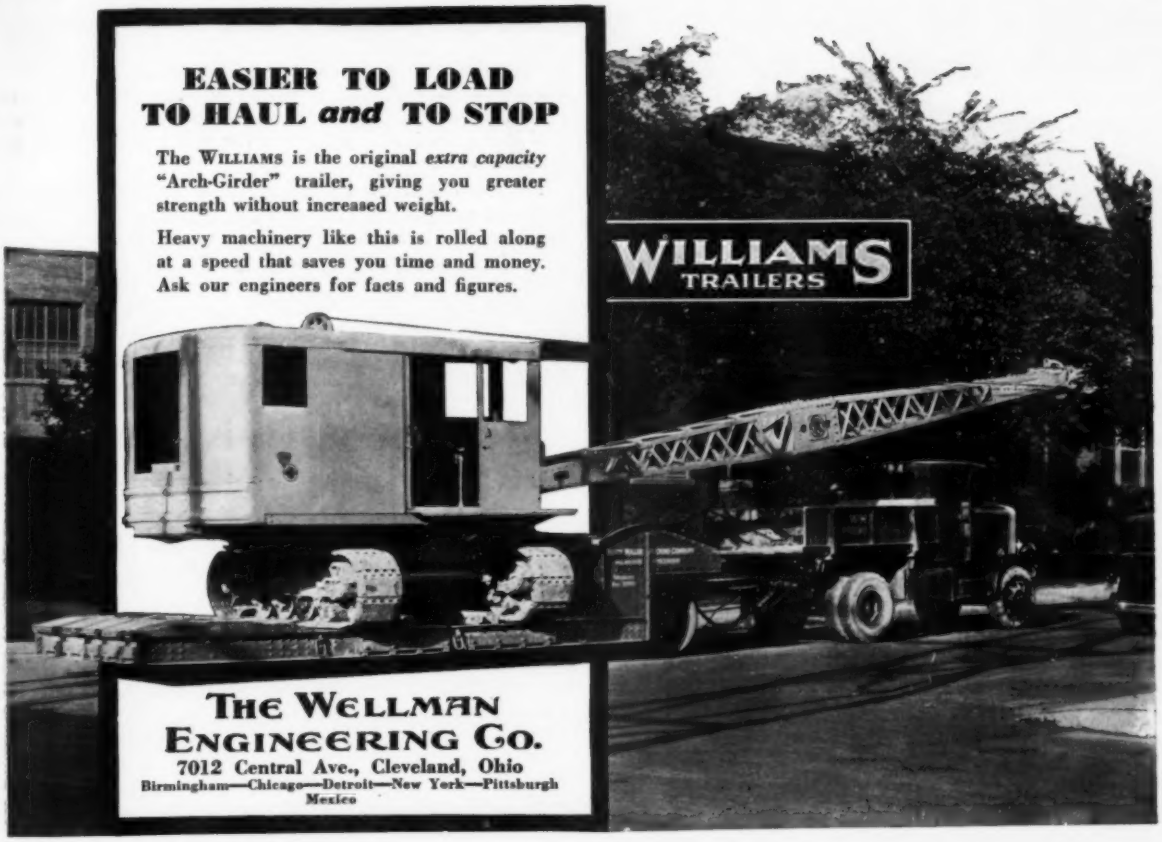
A NEW 7-bearing gasoline engine with 3-inch crankshaft developing from 39 to 85 horsepower at speeds ranging from 800 to 1,800 rpm has recently been announced by the Buda Co., Harvey, Ill., in its new Hivelo Model K-393. This engine, which is of the vertical type L head construction with six cylinders and operating on four cycles, has a modified 3-point suspension, standard magneto or battery ignition and force feed pressure lubrication to all crankshaft, camshaft and connecting-rod bearings as well as to the piston pin bearings. The distribution is effected through holes rifle-drilled in the crankcase.

The crankcase cylinders are one piece Ni-Chrome semi-steel castings and the crank case is divided horizontally 3 inches below the crankcase center. The connecting rods are special open hearth steel, heat treated, with I-beam sections, drilled through the entire length for piston pin lubrication. The net weight of the engine is 900 pounds.

EASIER TO LOAD TO HAUL *and* TO STOP

The WILLIAMS is the original *extra capacity* "Arch-Girder" trailer, giving you greater strength without increased weight.

Heavy machinery like this is rolled along at a speed that saves you time and money. Ask our engineers for facts and figures.



THE WELLMAN ENGINEERING CO.
7012 Central Ave., Cleveland, Ohio
Birmingham—Chicago—Detroit—New York—Pittsburgh
Mexico

WORTHINGTON

CONTRACTORS EQUIPMENT

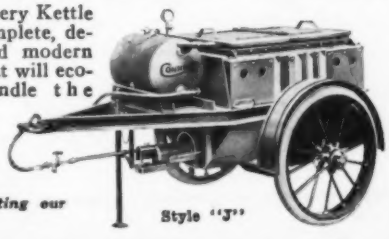
PORTABLE, SEMI-PORTABLE AND STATIONARY AIR COMPRESSORS
CENTRIFUGAL, POWER AND DEEP WELL PUMPS
DIESEL ENGINES
ROCK DRILLS
PAVEMENT BREAKERS
TRENCH DIGGERS
CLAY SPADES
BACKFILL TAMPERS

WORTHINGTON PUMP AND MACHINERY CORPORATION
Works: Harrison, N. J. Cincinnati, O. Buffalo, N. Y. Holyoke, Mass.
GENERAL OFFICES: HARRISON, N. J.
District Sales Offices or Representatives in Principal Cities
G-131

CONNERY'S OIL BURNING TAR AND ASPHALT HEATERS

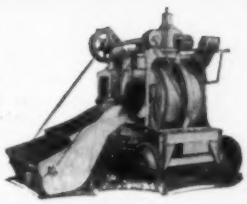
In the Connery Kettle you get a complete, dependable and modern outfit; one that will economically handle the toughest job.

WRITE TODAY for our little "BLUE BOOK" illustrating our complete line.


Style "J"

Connery & Company, Inc.
4000 N. Second Street, Philadelphia, Pa.

100% Modern



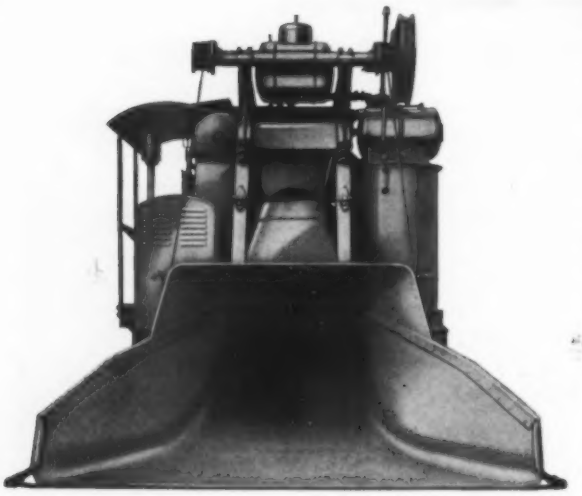
MASTER DRUM TYPE MIXERS

WONDER TILTING MIXERS

Hoists — Plaster Mixers — Pumps — Saw Rigs

CONSTRUCTION MACHINERY CO.
Waterloo, Iowa

The Most •• Improved Line!



The New Rex 1932 Model 27-E Paver

A 1932 Model 27-E Paver

A PAVER built for tandem hook-up and yet able to make high speed as a single machine has been announced by the Chain Belt Co., 1666 West Bruce St., Milwaukee, Wis. Some of the features which the manufacturers consider particularly notable are the 51-degree charging angle instead of a steeper angle, a 12-bucket drum which makes for unusually fast mixing and fast discharge. The Rex curved discharge chute is so built to catch each bucket load without spillage and, being rounded to fit the drum opening, permits the chute to be set at a steeper angle, insuring faster sliding and eliminating choking. The discharge chute is hinged outside the drum, relieving it of all wear occasioned by mixing.

The mixer drum is designed to meet the wear and strain which are expected from handling modern batches on higher production schedules. The heads are of pressed high-carbon steel to eliminate the danger of breakage and they are solidly welded to the center sheet. The mixing blades and buckets are of special alloy steel to minimize the abrasive wear of converting gravel, sand and cement into concrete. The new drum seal to prevent slopping of low slump concrete on super-elevations and grades is made of hard rubber and effectively seals the drum so that all the concrete mixed goes into the slab.

With the Rex Mechanical Man, all work of changing batches is limited to one foot movement by the operator who has nothing to do but drop the skip and handle the distributing bucket. The operator is not limited to the Mechanical Man and One Step Control for on curves, intersections or where manual operation is desirable, he can use all the levers without disconnecting the Mechanical Man.

The water control system is simple and accurate. The measurement is based upon an adjustable siphon in the center of the tank and a calibrated, micrometer-type control. The needle is set at the proper figure on the dial and the delivery of the right quantity is assured on the next and all succeeding batches. There are two tanks in the water system. The upper tank is fed by the line, during the entire mixing cycle. A special automatic valve cuts off the line water when the upper tank is full. The pipe to the lower, calibrated measuring tank is 2½ inches in diameter so that the lower tank fills rapidly. The pipe to the drum is 3½ inches in diameter and straight, insuring rapid delivery of the water to the drum and it is thrown far back into the batch. With the dual tanks, the hose connections can be changed without holding up a batch. Even with half-time batch meter settings on tandem hook-ups there is no hold up because of water. The skip is unusually wide so that even a dual pneumatic multi-batch truck can back in close "catty-cornered" without losing some of the batch over the skip side. Renewable 3/16-inch steel wear plates protect the skip throat from abrasive wear and the new steel skip nose can also be renewed. Particular care has been taken to streamline the skip. The cable drums are accurately grooved for steel core ¾-inch skip cables and fully machined to eliminate excessive wear.

The boom is swung by power and is controlled through a cushioned non-positive mechanism, independent of the bucket clutches. The boom can be swung while the bucket is spreading. The boom is made of two heavy 10-inch high-carbon steel channels each weighing 20 pounds per foot. The supporting sheave is mounted in a box truss construction of two long gusset plates, to prevent danger of boom warpage under heavy loads. The Rex 1932 Road-Maker is powered by a 65 horsepower, 1,500-rpm Waukesha 6-cylinder engine.

Hydraulic-Hoist Dump Body Has Several New Features

THE new slant-type pipeless hydraulic hoist for 1 and 1½-ton dump bodies, which has recently been announced by Anthony Co., Inc., Streator, Ill., has a number of new features. The hoist for this unit is of the heavy-duty type, with a 6-inch cylinder, and will handle continually all that the chassis itself will stand. The hoist pushes directly against the load, raising the body to a 55-degree angle.

The outstanding feature of these units is the shaker or muck remover, which is incorporated in all Anthony pipeless hydraulic hoists. This shaker is automatic and operates when the body reaches full dumped position, shaking to dislodge sticky or clinging loads. The degree of shake is controlled by the driver through the motor speed. The shaking is caused by an automatic valve within the cylinder opening and closing, making the pressures vary at regular intervals which causes the body to shake. The shaker is designed to save the chassis, transmission, differential, clutch, axles and universal joints, which are placed under severe abuse when the truck is rocked with the body in tipped position in an attempt to dislodge sticky loads.

Heavy-duty pipeless hydraulic hoists have also been developed for the 2, 2½, 3 and 3½-ton trucks. Other features are heavier and stronger bodies and the new type double-acting tailgate.

A Line and Surface Level

CONTRACTORS and municipal engineers frequently endeavor to use carpenters' levels in laying out lines and levels with strings and cord. The weight of the level causes all kinds of inaccuracy. Sand's Level & Tool Co., 8631 Gratiot Ave., Detroit, Mich., has developed a 3-inch line and surface level Number 555 which weighs only a half ounce, is easily carried in the pocket and is sturdy and effective. It is made of hard drawn aluminum tubing with nickel silver end pieces including a sturdy hook at each end with a properly spaced lug riveted to the body of the level. This prevents the level from falling off the line.

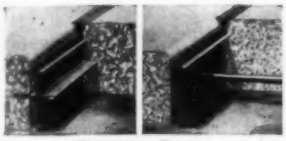
The bottom surface is made perfectly flat for accurate surface leveling. The fluid is slightly yellow consisting of alcohol and a drop of ether to increase its delicacy.

The New No. 555 Sand's Line and Surface Level

TRUSCON The Most Complete Line

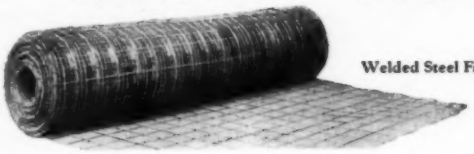
Products for Reinforcing Roads and Pavements

Steel Post Curb Bar



Expansion Joints

Contraction Plate



Welded Steel Fabric

IMPROVED ROAD FORMS

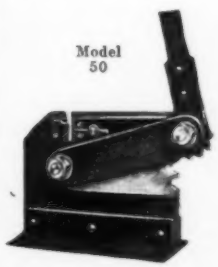
Truscon Steel Road Forms embody many new improvements which still further increase their efficiency and economy. The wider base and reinforced brackets add greatly to their stability and strength. All forms are completely interchangeable with each other so that different height units may be used together. Perfect alignment is assured by specially designed sliding connections and wedges.

Truscon also manufactures Welded Steel Fabric, Reinforcing Bars, Contraction Plates, Expansion Joints, Guard Posts, All-Steel Highway Crossings and other steel products for highway construction.

Write for catalogs and prices.

TRUSCON STEEL COMPANY
YOUNGSTOWN, OHIO
Sales and Engineering Offices in all Principal Cities.

G. D. S. FORGED STEEL BAR CUTTERS



Model 50

Made entirely of high grade steel plates and drop forgings.

Will cut steel reinforcing bars:

Model	Bars	Weight	Price
50/16	⅝"	40 lbs.	$28.00
50/20	¾"	60 "	35.00
50/23	⅞"	110 "	55.00
50/25	1"	165 "	65.00
51/32	1¼"	310 "	180.00
51/40	1½"	440 "	250.00

Descriptive bulletin of complete line will be furnished on request.

G. D. S. SHEARING & PUNCHING MACHINE CO.
109 LAFAYETTE ST. NEW YORK CITY

PORTABLE LIGHT PLANTS

ONAN PORTABLE ELECTRIC LITE and POWER PLANTS furnish 110 volt current. Have low initial and operating cost.

ROAD BUILDERS and GENERAL CONTRACTORS

Electric Lights pay large dividends and keep jobs and expensive road equipment running longer hours. Overcome losses caused by bad weather and hazards of breakdown by having plenty of light on shovels, draglines, dump, cook shanty and camp, and current to run electric tools.

One-cylinder 300 to 1800 watts

MANY SIZES

Sizes from 300 to 10,000 watts available from stock. Direct or Alternating Current, 60-cycle, 110-220-440 volt, single or three-phase. Prices $99 and up. There is a size for every purpose. Write for details.

D. W. ONAN & SONS
407 Royalston Ave., Minneapolis, Minn.

You want to know the resources of your bank. Why not inquire about the resources for service and research behind the company that supplies your explosives?

HERCULES POWDER COMPANY
INCORPORATED
915 KING STREET, WILMINGTON, DELAWARE A23-R

One of the New BMD Series of Industrial Locomotives

A New Industrial Locomotive Series

THE Brookville BMD industrial locomotive series in 4, 5, 6, 8, and 10-ton weights has recently been announced by the Brookville Locomotive Co., Brookville, Penna. Features of this new series are power, speed, structural strength, traction and handling ease. Its power is sufficient to slip all four steel-tired driving wheels on a dry sanded rail in both first and second gear and to attain speeds as high as 16 miles per hour in high gear, under governor control. Model BMD 8 and 10-ton locomotives have five speeds forward and five reverse while Model BMD 4, 5 and 6-ton machines have four speeds in each direction.

The power plant, clutch and transmission are McCormick-Deering and are installed without alterations, permitting servicing by the numerous dealers maintained by that company and minimizing delay for repair parts, if these are necessary.

A New Industrial Clutch

AN over-center or toggle-type clutch for industrial purposes has recently been announced by the Rockford Drilling Machine Co., Rockford, Ill. This clutch can be supplied complete with power take-off units of the plain or geared reduction type.

Features of this new clutch include simplicity of construction, pressure for the friction drive placed directly over the center of the frictional area, adjustment made from one easily accessible point which permits securing a micrometer variation with ease, and a clutch plate of a construction promoting smooth positive engagement without excessive shock to the motor or mechanism. Another feature is interchangeability with most automotive clutches, which is advantageous where gasoline motors are adaptable to both automotive and industrial purposes. This clutch is also adapted for use with a stand-by or auxiliary power unit, due to the absence of heavy revolving clutch parts on the inactive unit.

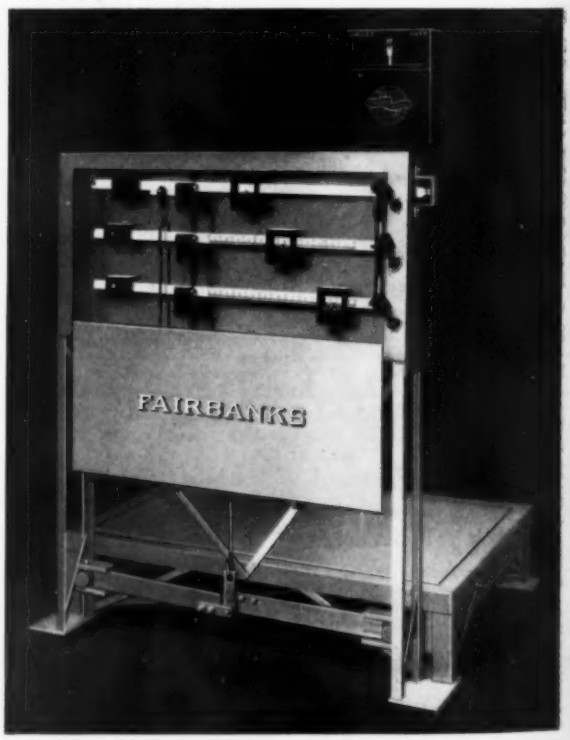
Sizes from 6 to 20 inches in diameter are available, with single or double-type plates, depending on the specific requirements and torque capacity of the motors.

Three-Beam Wheelbarrow Scales

THE weighing of all aggregates for concrete insures uniform quality and proper strength. All large concrete projects now require this weighing for concrete and an increasing number of small culvert and bridge jobs are now built under the same requirements. The Fairbanks wheelbarrow scale made by Fairbanks, Morse & Co., Chicago, Ill., enables the contractor to meet these rigid specifications without increasing the labor cost of mixing. This scale which is new in design is built in two sizes, No. 11909 with a platform 42 x 30 inches, weighing complete only 275 pounds, and No. 11910 which has a platform 42 x 42 inches and weighs 320 pounds. Both scales are built entirely of steel, welded throughout and thoroughly braced.

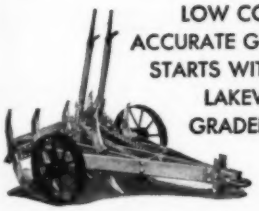
The scale is provided with three beams. The upper beam is a tare bar used to balance the weight of the empty wheelbarrows or carts. The two lower beams are each graduated to 500 pounds by 2-pound increments, one beam for sand and the other for stone. When it is required to weigh three aggregates, another beam can be furnished at a small extra price. When the upper beam is in the center of its travel as indicated by the tip of the beam extending through the beam box, the tell-tale device on top of the scale stands at zero. In using the scale, the tare bar poise is set to balance the empty wheelbarrow and is locked in position. The poise on the sand beam is located at the point representing the desired amount of sand for each wheelbarrow load and this poise is locked in position. The poise on the stone beam is likewise located at the proper point and locked. Either the sand or the stone beam may be thrown into weighing position independently of the other. The beam box may be locked after the poises are set, so that they cannot be tampered with.

A tell-tale device is connected with the beams and is mounted on top so that it can be swung to any angle to insure easy reading for any position of the operator. This is a new style of over-and-under device containing no springs and is well protected from dust and corrosion. The scale platform is only 9 inches from the ground. The frame of the scale is open on all sides so as to make it easy to keep clean. The platform may be easily lifted off when it is necessary to completely clean the scale parts. The scale is so constructed that it is foolproof against the danger of getting out of order when in transport from place to place. Angle iron lugs are placed at either side of the scale to receive the approach planks for the wheelbarrows or carts. These scales are also furnished with guides built of angle iron to prevent concrete buggies being run against the beam box.



A Rear View of a Three-Beam Wheelbarrow Scale, Showing the Opened Beam Box

Use It Only a Few Hours... Save Money All Day . . . LAKEWOOD SUBGRADER



LOW COST ACCURATE GRADING STARTS WITH THE LAKEWOOD GRADEROOTER

Replaces rooter plow. Roots 48 inches wide at one time, is light enough for mule team, strong enough to use with 10-ton tractor.

IN one to three hours the Lakewood Subgrader will produce an accurate subgrade, sufficient for the entire day's run, leaving the roadway clear for truck hauling and the contractor insured against low grades and resulting losses in concrete.

Quickly adjustable in width and for any depth of cut and specified crown, this machine cuts a TRUE subgrade at a cost much LOWER than when done by less accurate methods. No other piece of paving equipment "BUYS ITSELF" so fast.

Write or wire for CATALOG CE.

LAKEWOOD FINISHER for fast, steady production, concrete or bituminous pavements.

THE LAKEWOOD ENGINEERING CO., Columbus, Ohio

ROAD PUMPS | ROAD FORMS | SUBGRADE TESTERS | STRAIGHT EDGES | HAND BELTS | BATCH BOXES | FLOAT BRIDGES

CUMMER
ASPHALT PLANTS

Hot Mix and Cold Mix
Cummer Dryer-Coolers
Cummer Two-Fire Dryers
Portable and Stationary
Mixers—½ ton, ¾ ton, 1 ton, 2 ton

THE F. D. CUMMER & SON CO.
CLEVELAND OHIO

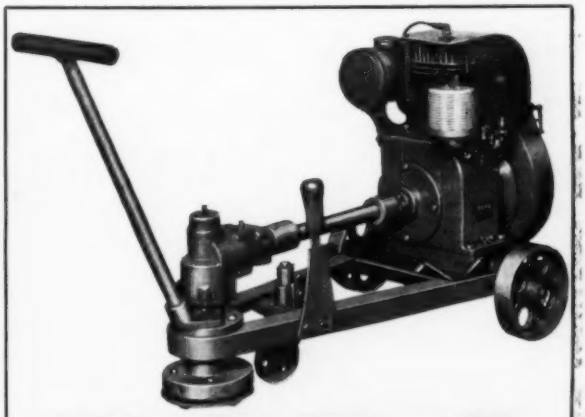
One-A-Minute Column Clamp

W. A. K. Column Clamps

will save money for you too. Let us send a trial order to you on your next job. They cost less, weigh only 1½ pounds; only three parts; four inches by four inches overall; fit all columns.

Mail ad with request

W. A. KUHLMAN & CO. TOLEDO OHIO



BERG
HI-WAY SURFACER

Cuts down high spots, uneven expansion joints, repaired patches—quicker, better and more economically than any other machine or method. Used and endorsed by State Highway departments, municipalities, leading highway engineers and contractors throughout the country.

Complete details and prices of the New, Improved BERG will be mailed on request.

THE CONCRETE SURFACING MACHINERY CO.
4159 Spring Grove Avenue Cincinnati, Ohio

Catalogs for CONTRACTORS

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

An Economical Jaw Crusher

522 Diamond Iron Works, Inc., Minneapolis, Minn., will be glad to send to those interested complete information in regard to the Diamond Timken roller bearing jaw crusher which operates reliably and economically in the scalping unit of a semi-portable washing plant, in a double unit crushing and screening plant or in the portable quarry plant.

A Portable Conveyor With 14-Inch Belt

523 Catalog No. 530 recently issued by the Jeffrey Mfg. Co., Columbus, Ohio, describes the complete line of Jeffrey portable equipment for handling cinders, sand, gravel and stone, which comprises self-propelling heavy-duty loaders, scraper conveyors with power raising and lowering devices, portable belt conveyors and car unloaders as well as Junior bucket loaders and heavy-duty bucket loaders.

Low Cost Durable Roads

524 Complete information in regard to Stanolind asphalts and road oils, which permit the construction of roads and pavements at low cost and, because of their durability and resistance to wear, necessitate the minimum of maintenance, may be secured by interested contractors and road officials from the Standard Oil Co. of Indiana, 910 So. Michigan Ave., Chicago, Ill.

Oil, Tar and Asphalt Distributors

525 E. D. Etnyre & Co., Oregon, Ill., will be glad to send to those interested full details in regard to the Etnyre distributors for oil, tar and asphalt which are designed for uniform distribution, efficiency, dependability and low cost operation.

A One-Man Automatic Tractor Scraper

526 The Schaefer one-man scraper, a sturdily-built labor saving unit for operation with a tractor, is described in literature which the Gustav Schaefer Co., 4180 Lorain Ave., Cleveland, Ohio, will be glad to send on request.

A New Clamp for Scaffolds

527 An illustrated circular describing the new Expansion scaffold clamp which splices anything from a 3 x 3 upright to a 6 x 6 by simply tightening one nut may be secured by interested contractors from the Expansion Scaffold Clamp Co., 36-40 Bowne St., Flushing, N. Y.

Lights for Night Work

528 The National Carbide V-G lights, which afford daytime conditions on night jobs, light up the job for 12 hours on one 7-pound charge of carbide and 7 gallons of water and are easily handled by one man, are described in literature which the National Carbide Sales Corp., Lincoln Bldg., New York City, will send on request.

A 1932 Model 27-E Paver

529 The Chain Belt Co., 1666 West Bruce St., Milwaukee, Wis., has recently issued its Catalog No. 209 describing the Rex Road-Maker, a 1932 paver for 1932 requirements. A copy of this catalog will be sent to readers of CONTRACTORS AND ENGINEERS MONTHLY free upon request.

A New Hydraulic Dirt Mover

530 Complete information in regard to the new Jumbo hydraulic dirt mover, which is made in two sizes for 30 and 60-horsepower tractors, and is designed for hauling dirt long distances, building bridge approaches, hauling out of borrow pits, dumping over traps, hauling up or down hill, and other dirt moving jobs, may be secured by those interested from the Jumbo Scraper Co., 2440 E. 14th St., Los Angeles, Calif.

Dry Digging Conditions

531 Moretrench Corp., 90 West St., New York City, will be glad to send to those interested complete information in regard to the Moretrench well point system for predraining swamps and wet localities to insure dry digging conditions on any job anywhere.

A Line of General Purpose Motors

532 The Lauson Corp., 100 Ogden Ave., New Holstein, Wis., will be glad to send to those interested full information in regard to Lauson general purpose motors, which are made in eight sizes, of ½ to 1½ horsepower, as well as other Lauson vertical engines from 1½ to 3 horsepower.

Easily Set-Up Road Guards

533 McCurdy all steel road guards which are easily set up in a minute, as easily taken down and collapsed for portability are described in literature which the McCurdy Steel Products Co., Ada, Ohio, will be glad to send on request.

Three New Diesel Locomotives

534 Three new models of Plymouth diesel locomotives, including Model FLD 6-ton, Model DLD 8-ton and DLD 10-ton units, all of which are equipped with Cummins diesel engines, are described in Bulletin FLD which the Fate-Root-Heath Co. (Plymouth Locomotive Works), Plymouth, O., will be glad to send on request.

Vibrating Hammers for Concrete Work

535 A complete description, specifications, illustrations and prices on the two new electric portable hammers for vibrating concrete, as well as other electric tools for the construction industry, are contained in the 1932 catalog which the Syntron Co., 400 Lexington Ave., Pittsburgh, Penn., will be glad to send on request.

Manila Rope for Construction Work

536 The size, weight and strength specifications of manila rope are included in folders issued by The Edwin H. Fitler Co., Philadelphia, Pa., manufacturers of trade mark waterproof manila rope since 1817.

A New 6-Cylinder 1½-Ton Truck

537 The new Model A-3 6-cylinder, 1½-ton truck with 136-inch or 160-inch wheelbase announced by the International Harvester Co. of America, Inc., 606 South Michigan Ave., Chicago, Ill., is completely described in detailed specifications and literature which may be secured from the manufacturer direct.

Pumping Plant for Sand and Gravel Production

538 Bulletin 141 recently issued by Morris Machine Works, Baldwinsville, N. Y., features Morris centrifugal pumps, hydraulic dredges, dredge accessories, and complete equipment for producing sand and gravel in plants of small and moderate capacities. Bulletin 142 describes Morris medium-duty pumps for sand and gravel, dredging and similar services where water containing abrasive material in suspension is to be pumped. Typical performance curves, and tables of direct-connected pumps are also included.

Three-Beam Wheelbarrow Scales

539 The Fairbanks wheelbarrow scale which provides an accurate scientific control for concrete mixes on small jobs is completely described in publication ASL 208.2A which may be secured from Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. The scale has many features making it particularly adaptable to the use of contractors handling a large number of small concrete jobs.

SEND THIS BACK— WE WILL DO THE REST

CONTRACTORS AND ENGINEERS MONTHLY
470 Fourth Avenue, New York

Gentlemen: Please send me the following literature, without cost or obligation

.....

(Indicate by numbers)

Name ..... Firm Name..... .....

Address ....
(Street and Number) *(City and State)*

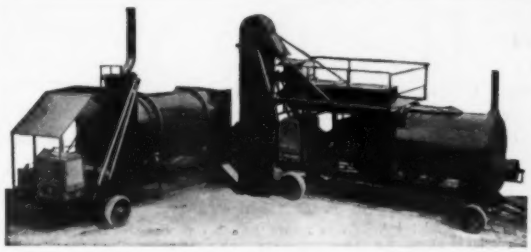
If You Want

to procure the best and most modern road roller with the most economical and satisfactory performance—then write the following requirements into your specifications:

Speeds:	Same three speeds backward and forward. Change of direction to be accomplished without shifting gears.
Transmission:	All gears enclosed, running in oil, and mounted in anti-friction bearings.
Steering:	Steering mechanism completely equipped with anti-friction bearings to eliminate necessity of power steering.
Front End:	All steel gyroscopic front end construction.
Frame:	All steel frame with steel head casting, straight side frame plates, free from notches or slots.
Rolls:	Semi-steel.
Engine:	Six cylinders, standard equipment.

Operating Speed: 5 to 5½ miles per hour in high gear.

THE HERCULES CO.
Marion, Ohio



NEW Complete Line of Bituminous Road and Street Machinery

FOR MAKING HOT AND COLD MIXES

All Portable

Road Mix Pavers
Central Cold Mixing Plants
Pug Mill Mixers
Pre-Mix Plants, Hot and Cold
Driers for Sand and Stone
Street Repair Patchers
Asphalt Plants
Tar Kettles, with Spray Pumps
Surface and Tool Heaters

Descriptive Catalog Free on Request

Chausse Oil Burner Company
Elkhart Indiana

LAUSON

LA-815
1¼-1½-hp.
Air-Cooled

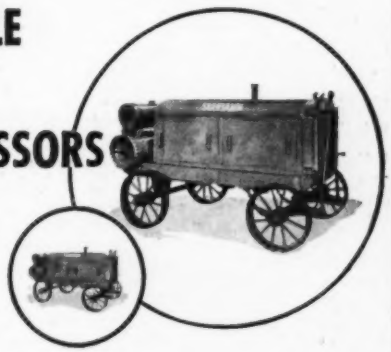
MANUFACTURERS JOBBERS—DEALERS

There are 8 sizes of General Purpose Motors from ½ to 1½-hp. Also other Lauson Vertical Engines, from 1½ to 3-hp.; and Horizontal Engines from 1½ to 18-hp. Write for details on the complete Lauson Line.

This Lauson 4-cycle General Purpose Motor is also furnished in the water-cooled type equipped for circulating water, radiator or tank cooler.

THE LAUSON CORPORATION 100 Ogden Avenue New Holstein, Wis.

PORTABLE AIR COMPRESSORS



Any size for any job

Eight sizes—36, 72, 120, 180, 240, 360, 540 and 720-cubic foot displacements—each size built of the same SCHRAMM design and equipped with the clutch (except the 36-cubic foot) for easy starting.

SCHRAMM Portable Air Compressors are available in many types of trailer mountings for adaption on any kind of road, construction or street work.

Write for the 1932 catalog describing the latest SCHRAMM features and sizes

SCHRAMM, INC.
West Chester Pa.

Schramm

MARION MULES

The oscillating front axle on Marion Mules permits an even haul over uneven roads, excavations, or fills. The angle of oscillation causes either front wheel to operate perfectly within a 21-inch verticle movement. . . . Rubber tires can be furnished as regular equipment as well as steel wheels or crawlers. . . . Complete information and prices will be mailed upon request.

MARION MULES
MARION, OHIO

A New Portable Welder

540 Schramm, Inc., West Chester, Penn., will be glad to send to interested contractors a complete description of its complete line of portable engine-driven welders, which are made in four sizes, 200, 300, 400 and 600 amperes, and supplied with any type of mounting, to meet the welding requirements of the construction industry.

A Liquid for Concrete Waterproofing

541 Literature describing specifications and characteristics of Acqua-Pruf, a liquid integral for concrete which makes it waterproof, quickly set and acts as an anti-freeze, may be secured by those interested from Acqua-Pruf, Inc., 786 Broad St., Newark, N. J.

A Mechanically-Operated Rotary Scraper

542 The Model DA Atlas rotary power scraper which is mechanically-operated, simple in design, rugged in construction and easy to operate behind any tractor is described in literature which the Atlas Scraper Co., 6203 Maywood Ave., Bell, Los Angeles, Calif., will be glad to send on request.

An Agitator Body for Wet Concrete

543 Hug Co., Highland, Ill., will be glad to send to those interested a complete description of the new Hug spring blade agitator body for the transportation of wet concrete, in which the agitation is effected by four spring blades rotating through the concrete, and which may be secured in 2 and 3-cubic yard capacity sizes.

A New Manufactured Stone

544 Benedict Stone Products Co., 122 So. Michigan Ave., Chicago, Ill., will be glad to send to those interested its 8-page illustrated folder describing Vibrastone, a manufactured stone which combines beauty with the advantages of reinforced concrete.

Road Discs to Cut the Bumps from Pavements

545 The Model 4A road disc made by the Killefer Mfg. Corp., Ltd., 5525 Downey Road, Los Angeles, Cal., for cutting the bumps from oil treated roads or old asphalt macadam streets is completely described and illustrated in Folder R-681 which may be secured direct from the manufacturer.

Hydraulic-Hoist Dump Body with New Features

546 Anthony Co., Inc., Streator, Ill., will be glad to send to interested contractors complete information in regard to the new slant-type pipeless hydraulic hoist for 1 and 1½-ton dump bodies, the outstanding feature of which is the shaker or muck remover, which automatically shakes the body when it is in dumped position to remove all sticky or clinging material.

An Aluminum Boom for Draglines

547 Complete information in regard to the new aluminum boom for any size of dragline, which weighs only two-thirds of the weight of a steel boom, may be secured on request from the Bucyrus-Erie Co., South Milwaukee, Wis.

Two New Truck Models

548 Federal Motor Truck Co., Detroit, Mich., will be glad to send to those interested complete information in regard to the two new Federal trucks, one a 1½-ton 6-cylinder truck chassis and the other a high-speed 5 to 6-ton model for heavy-duty service.

A New Industrial Clutch

549 A complete description of the new Rockford over-center or toggle-type clutch for industrial purposes, which is available in sizes from 6 to 20 inches in diameter, with single or double-type drive plates, may be secured by those interested from the Rockford Drilling Machine Co., Rockford, Ill.

A Portable Lever Rod-Cutting Machine

550 The Model-50 lever rod-cutting machine for reinforced concrete work made by the G. D. S. Shearing & Punching Machine Co., 109 Lafayette St., New York City is completely described in the shearing and punching machine literature which the manufacturer will be pleased to send free on request.

A Welder with Two Flames

551 The Linde Air Products Co., 30 East 42nd St., New York City, will be pleased to send complete information to any contractor on the new Oxweld W-21 Lindewelder which utilizes two flames, one for preheating the welding rod and one for performing the actual welding operation. These are mounted on a carriage which supports the blow pipe during the operation.

An Anti-Freeze System for Air Lines

552 Bulletin No. 100-C describing Tanner tanks and Tannergas, an anti-freeze system for compressed air lines and air tools may be secured by interested contractors from Sullivan Machinery Co., 814 Wrigley Bldg., Chicago, Ill.

A Spreader for Bituminous Material

553 Complete information in regard to the Hembell Spreadmix Finisher, a unit which spreads, mixes and levels any type of base or surfacing material in depths of from 1 to 8 inches to a condition ready for finishing machine or rolling, may be secured by those interested from Spears-Wells Machinery Co., Oakland, Calif.

Self-Priming Centrifugal Pumps

554 Bulletin No. 164, describing the complete line of Novo self-priming centrifugal pumps, in sizes 2, 2½, 3, 4 and 6 inches, and various styles of mountings, may be secured by interested contractors from the Novo Engine Co., 216 Porter St., Lansing, Mich.

A Road Maintainer with a Rake

555 The York Super Workman, which is a combination machine of scarifier, grader and rake, for reclaiming and maintaining roads, is described in literature which the York Modern Corp., Unadilla, N. Y., will be glad to send on request.

Heavy Grading Equipment

556 R. G. Le Tourneau, Inc., Roosevelt St. and Wilson Way, Stockton, Calif., will be glad to send to those interested literature describing the complete line of heavy grading equipment, including control units for operating bulldozers, scarifiers, scrapers, and similar equipment, bulldozers, scrapers, hardpan rooters, rollers and dump carts.

A Bigger 1932 Paver

557 The 1932 MultiFoote paver, which is bigger, stronger and faster than previous models, the upkeep costs of which have been reduced by added accessibility, increased size and strength of parts, is described in literature which the Foote Co., Inc., Nunda, N. Y., will be glad to send on request.

A New 180-200-Horsepower Pull Diesel Engine

558 Engine Bulletin No. 870, recently issued by the Waukesha Motor Co., Waukesha, Wis., describes completely the new diesel Great Six Model 6-DLK Waukesha engine of particular value in the construction and municipal fields.

An Improved Road Shoulder Finishing Machine

559 Complete information regarding the new Whitcomb-Lehmer road shoulder finishing machine, which is mounted on a Hug truck with a 100-horsepower engine and a low gear ratio permitting handling more dirt and with an adjustable boom to take care of all ditch contours, may be secured from the Whitcomb Locomotive Co., Rochelle, Ill.

Road Machinery in Action

560 A pictorial bulletin of 24 pages featuring the entire Austin-Western line of road machinery in action has just been released by the Austin-Western Road Machinery Co., 400 No. Michigan Ave., Chicago, Ill., and may be secured by any municipal officials or contractors interested. This Bulletin 1247 is unusual in its pictorial quality and character.

A New Industrial Locomotive Series

561 Literature describing the Brookville BMD series of industrial locomotives in 4, 5, 6, 8 and 10-ton weights, features of which are power, speed, structural strength, traction and ease in handling, may be secured by those interested from the Brookville Locomotive Co., Brookville, Penna.

A New Bituminous Sewer Joint Compound

562 Sani-Tite, a new bituminous joint compound for tile or concrete sewer pipe, which makes strong water-tight joints, adheres to the tile or concrete, resists alkalinity and acidity, gives flexibility without sacrificing strength and other features, is described in a circular issued by the Hydraulic Development Corp., 50 Church St., New York City.

Economical and Easily Installed Corrugated Culverts

563 Full details in regard to Gohi corrugated culverts which are economical, easily installed in any weather, flexible and strong, may be secured by those interested from the Gohi Culvert Manufacturers, Inc., Newport, Ky.

A New 42-90-Horsepower Gas Engine

564 The new Buda Hivelo Model K-393 gas engine with a seven bearing crankshaft operating at speeds from 800 to 1,800 rpm is completely described in Bulletins 759 and 767 which may be secured from the Buda Co., Harvey, Ill.

A Fast Clean-up and Rehandling Bucket

565 The new "Champion" clean-up rehandler of the Williams line of buckets made by The Wellman Engineering Co., 7012 Central Ave., Cleveland, Ohio, is completely described with full specifications and illustrations, in a folder which may be secured direct from the manufacturer.

Sectional Belt Conveyors

566 The Fairfield Engineering Co., Marion, Ohio, has recently increased its line of elevating and conveying machinery to include sectional conveyors which are built of standardized units readily joined together by means of heavy sleeve bolts and capable of handling 160 to 290 tons per hour depending upon the belt width. Descriptive literature may be secured by those interested.

Data on Threadlocking Devices

567 Dardelet Threadlock Corp., 120 Broadway, New York City, will be pleased to send to any contractors or engineers interested a reprint of the Bureau of Standards Research Paper Number 386 entitled, "The Relation of Torque to Tension for Threadlocking Devices." This company manufactures the Dardelet threadlock bolts which are effective in construction work.

Seamless Steel Pipe Fittings for Welding

568 Bulletin 32-1 issued by the Taylor Forge & Pipe Works, P. O. Box 485, Chicago, Ill, tabulates up to date dimensional and list price data on Taylor forge seamless steel fittings for welding and Taylor forge flanges.

Road Building Accessories

569 A supplement to Building Specialty Catalog No. 229, describing Union road building accessories, including bar supports and spacers, bar ties, chairs, and screed and hi-chair combinations may be secured by interested contractors from Union Steel Products Co., Albion, Mich.

Concrete Curb and Gutter Blocks

570 The American Curb-Gutter Block Co., 499 Seventh Ave., New York City, offers an opportunity to contractors or municipalities to manufacture curb-gutter blocks in a relatively small machine, the product being adapted to making a unit curb and gutter for driveways, parks, cemeteries and developments.

Gasoline, Steam and Electric Hoists

571 Three new catalogs, Nos. 42, 43 and 44, describing the complete line of Lambert-National steam, electric and gasoline hoists, respectively, which are made in a range of sizes and types to meet the various requirements of construction jobs, may be secured by interested contractors from McKiernan-Terry Corp., 19 Park Row, New York City.

Material Handling Equipment

572 This is the title of a new folder describing the complete line of Cedar Rapids equipment, including crushers, road mixers, screening and loading plants, pre-mix units, tractor-crusher units, stone-sizing plants, washing plants, and the one-piece crushing, screening and loading plants. Copies of this folder may be secured by those interested from the Iowa Mfg. Co., Cedar Rapids, Ia.